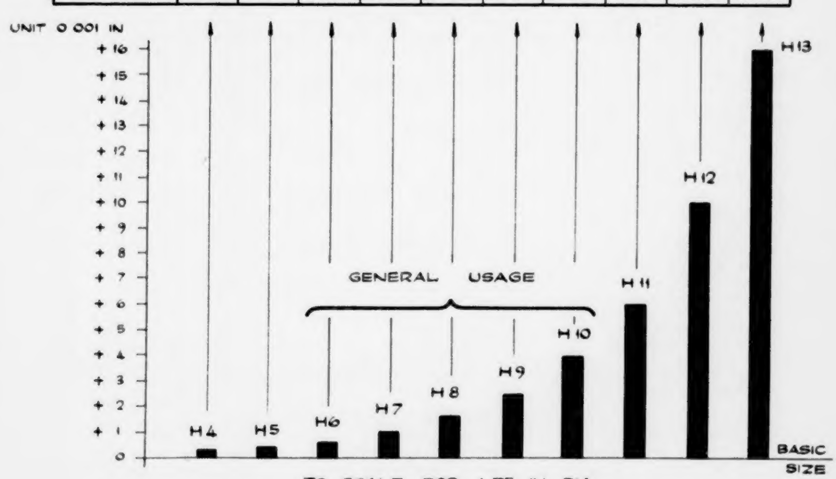
MAY 1953

News Magazine of the American Standards Association, Incorporated

DIAMETERS OVER : TO (INS.)	TOLERANCE GRADES TOLERANCE UNIT 0·001 IN.									
	GR 4	GR 5	GR 6	GR 7	GR 8	GR 9	GR 10	GR 11	GR 12	GR 13
·04 – ·12	·15	·2	·25	·4	·6	1·0	1·6	2·5	4·0	6·0
·12 – ·24	15	·2	·3	·5	·7	1·2	1·8	3·0	5·0	7·0
·24 – ·40	·15	·25	·4	·6	·9	1·4	2·2	3·5	6·0	9·0
·40 – ·71	·2	·3	·4	·7	1·0	1·6	2·8	4·0	7·0	10·0
·71 – 1·19	·25	·4	·5	·8	1·2	2·0	3·5	5·0	8·0	12·0
1·19 – 1·97	·3	·4	·6	1·0	1·6	2·5	4·0	6·0	10·0	16·0
1·97 – 3·15	·3	·5	·7	1·2	1·8	3·0	4·5	7·0	12·0	18·0
3·15 – 4·73	·4	·6	·9	1·4	2·2	3·5	5·0	9·0	14·0	22·0
4·73 – 7·09	·5	·7	1·0	1·6	2·5	4·0	6·0	10·0	16·0	25·0
7·09 – 9·85	·6	·8	1·2	1·8	2·8	4·5	7·0	12·0	18·0	28·0
9·85 – 12·41	·6	·9	1·2	2·0	3·0	5·0	8·0	12·0	20·0	30·0
12·41 – 15·75	·7	1·0	1·4	2·2	3·5	6·0	9·0	14·0	22·0	35·0
15·75 – 19·69	·8	1·0	1·6	2·5	4·0	6·0	10·0	16·0	25·0	40·0
HOLES	H4	H5	H6	H7	H8	H9	H10	H11	H12	H13



PROPOSED ABC SYSTEM OF LIMITS AND FITS

ABC Fundamental Tolerances

The table shown above provides ten grades of accuracy: GR 4 to GR 13. The Proposed ABC System of Limits and Fits, reviewed in this issue, contains tables of clearance, transition, and interference fits between holes and shafts with limits derived from the applicable allowances and fundamental tolerances.

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Marginal Notes

What to Look for in Our Next Issue—

How do the new American Standards on rayon and acetate fabrics affect you in your choice of clothing and household articles? In our June issue the new standards will be discussed with this question in mind.

The ups-and-downs of machine tool purchasing underscore industrial trends in the country's technical and economic news. The role of standardization in the machine tool industry will be the subject of one of our feature articles next month.

Too often the vast amount of research and new knowledge that goes into the development of American Standards is lost sight of by the time standards reach final approval. This is not the case in the far-reaching program on cast-iron pipe that has reached fruition with approval of nine American Standards during the past year. How the research programs carried out under the auspices of Sectional Committee A21 affected the development of these standards is being discussed in June.

As a special service to readers of STANDARDIZATION, a new edition of the price list of American Standards will be sent you as Part 2 of the June issue. This gives you an up-to-date list of all American Standards approved and published, with an index, and prices at which the standards can be purchased.

New Service on Trial—

At a recent meeting of the Conference of Executives of ASA Member Organizations, it was suggested that STANDARDIZATION start a new service to members. This is a list of new publications issued by Member-Bodies and Associate Members and sent to ASA for reference and for listing. The first "Recent Publications Received from ASA Members" is published in this issue on page 159. Further information about these publications or copies of them can be obtained from the publishing organizations. This list is on trial. If it is

a real service to readers, it will be continued on a permanent basis.

Blowing Our Horn—

It is sometimes a good idea to blow our own horn. We think you will be pleased, too, as we are, to know that articles published in STANDARDIZATION are being used in company operations and reprinted in other publications. Most recent request for permission to reprint comes from an American company with a branch in Pakistan. Seems the Pakistan branch thinks a recent STANDARDIZATION article about the company's operations should be widely distributed to their Pakistan customers. The recent article on ladder safety, "It Pays To Be Careful" has also been reprinted by several companies for distribution to plant employees. Other articles widely used include the Standard Pressed Steel Company's "Specials Can Be Licked," the feature on "How To Check Quality of Surface Finish," and the one on "How to Check Oxychloride Cement Fooring."

Order Your Reprints—

Dr Gaillard's analysis of the ABC proposals on recommended fits is so basic to a consideration of the entire problem that reprints of the article (page 137) and of the proposals made at the ABC conference are being made available. Copies can be ordered from ASA at 75 cents for the ABC Proposal; 25 cents for Dr Gaillard's article analyzing the proposal.

Standards Engineers Society—

The Standards Engineers Society is holding its annual meeting in New York June 11. Place and Time:—Johnny Victor Theater, RCA Exhibition Hall, 40 West 49 Street, New York, at 8:00 p.m. Speaker will be V. deP. Goubeau, Vice-President and Director of Materials, RCA Victor Division. His subject will be Advantages of Standardization to Procurement Activities. The Society now boasts a New York Chapter as well as one in Philadelphia.

Opinions expressed by authors in STANDARDIZATION *are not necessarily those of the American Standards Association.*

Standardization

Formerly Industrial Standardization

ASA
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MAY, 1953 VOL. 24, No. 5

Standardization is dynamic, not static. It means not to stand still, but to move forward together.

Single copy 35¢. $4.00 per year (foreign $5.00). Schools and libraries $3.00 (foreign $4.00). This publication is indexed in the Engineering Index and the Industrial Arts Index. Re-entered as second class matter Jan. 11, 1949, at the P.O., New York, N. Y., under the Act of March 3, 1879.

Republic Aviation Corp

Jet engines drain scarce materials, call for development of alternates. Thunderjet fighters (above) fly at 600-plus mph; have 800-plus miles combat radius; and service ceiling of 45,000-plus feet.

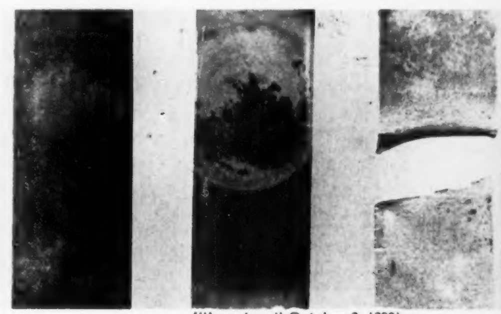
The United States is a "need more" nation, not a "have not" nation, Dr Verne Schnee told ASA's Standard Council at its meeting April 2. A great range of alternate materials—materials that are not substitutes but that will do the job well enough—is being developed to help meet the country's need for more materials, he said.

Dr. Schnee is Executive Director of the Mineral and Metals Advisory Board of the National Academy of Sciences. The Academy functions under contracts with the Department of Defense and civilian agencies headed by the Defense Materials Procurement Agency. When called upon in connection with a metallurgical problem of national importance, for example, it brings together experts from all parts of the country to meet with their opposite numbers in the Armed Services or in the civilian agencies. In the past it has been an effective device through which industry could talk with government. Today it is running into difficulty—on standards for the materials needed, and on presenting government's viewpoint to industry.

The need for alternate materials is not a wartime phenomenon, Dr Schnee said. Jet engines, for example, are not only needed for aircraft or for military equipment; they are being designed for use in trucks and in boats and ships. They are a drain on scarce materials, such as nickel, cobalt, columbium—the so-called high-temperature alloys. It is necessary now to develop usable alternate alloys and get them into service. The research metallurgist is up against many difficult problems due to today's rapidly changing conditions. Dr Schnee called on Dr W. J. Harris, Jr, to give some examples of these problems. Dr Harris is executive secretary of the Minerals and Metals Advisory Board of the Academy. His challenge to national groups interested in standards is published below.

Control of Metallurgical Standards

by W. J. Harris, Jr



("Iron Age," October 9, 1952)

One reason why titanium is being stockpiled. Three test strips give dramatic evidence of titanium's heat resistance for limited intervals. Titanium (left); Stainless steel—Type 302 (center); 24ST Alclad aluminum alloy (right). All were exposed to 2000 F flames. Titanium showed least effect after 30 minutes.

METALLURGICAL research groups of the country look on standards as the end products of research.

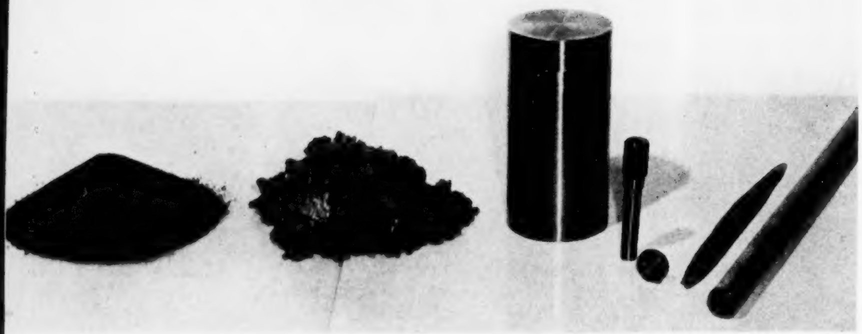
While research and development have the important function of providing new concepts and ideas, it is likewise their function to furnish numbers and data. These quantitative aspects have a direct application to your work. The problem of applying techniques for use of new scientific material to the control of metallurgical standards is of increasing importance to all of us. There is in the world today a series of new developments in regard to administration of research, and in regard to military developments for the national defense. These developments alter the old relationships, developed by years of trial and error, for arriving at appropirate standards and specifications. As an example of how the old relationships have developed, the American Standards Association and its cooperating societies, such as the American Society for Testing Materials, include on their technical working groups—those groups which prepare the basic documents for later policy action—representatives of the producing and consuming industries, and also a group stated to be "the general interest group."

In the past, perhaps until 1941 or 1942, the bulk of research was performed in laboratories of consumers and producers. The results of research performed under these auspices were transferred directly to the committee members concerned with standardization and specifications. A very large number of the technical committees of the various societies devoted much time to analyzing research reports to determine their impact on change in specifications. Furthermore, there was broad industrial experience with the true requirements, and basic understanding of what a material was expected to do in service.

During the last war, and certainly subsequent to it, a comprehensive modification of this system has been in progress.

On the one hand there has been a substantial increase in the support of research by the Government. The national outlay for research and development was estimated to total more than 3.5 billion dollars in 1952. Two-thirds was for work in laboratories and facilities of private industry; one-fourth was for work by the Federal Government in its own laboratories; and the remainder was for work in colleges and universities. At least half of the work in the laboratories of private industry was government-sponsored.

The 25 percent of the new research effort which is being performed in government laboratories or in the universities is not a part of the producer-consumer team which still remains responsible for standards and specifications. This tremendous research effort was a re-



E. I. Du Pont de Nemours & Co

Stages of production of titanium, important for high-speed weapons—Raw material is ilmenite (left). First stage of metal is in form of sponge (second left). Shown next is ingot of titanium. To right are small fabricated pieces, used for test purposes.

sult of the new mechanical warfare to which we are committed in view of our need to match the manpower of our potential enemies with our technological ingenuity. The new kinds of weapons—gas turbines for aircraft use, ramjets, rockets and guided missiles, complex fusing devices, very accurate but complex radar units—all of these new weapons of war have posed design concepts far beyond those of any civilian counterparts. The non-economic factors of high performance, reduced weight, and vast destructive purpose have made it necessary to devise entirely new concepts of strength of materials, and similar factors. As a result, materials themselves are expected to perform under conditions to which no industrial units have yet been subjected. Research in government laboratories was supported in part to answer these new problems.

There is growing realization that the metallurgists of the country must attempt to understand, interpret, and apply the results of all current research in order to make more effective some existing weapons, and to make possible the production of new and even more deadly equipment. This is a major problem, and is leading to a very serious administrative difficulty. The traditional methods and organizations which have been responsible for the publication, and to an extent, the interpretation and analysis of work of this kind, are scarcely able to cope with the flood of reports and data. Therefore, you who are responsible for feeding published information into specifications and standards have an even greater problem.

Standards are not dead, but rather living, growing concepts. They feed on new data, and any failure of the system which provides the data is reflected in a stunted or inadequately nourished standard.

Problems of military classification likewise render the normal approaches to these problems ineffective. If it is true that the end product of research is a standard or a specification, then there is a grave and serious responsibility resting on the standards groups to take advantage of the new knowledge. Otherwise you will be a silent party to its dissipation and loss.

The civilian agencies of the government and the Department of Defense have as their policy a requirement for use of industrial standards and specifications wherever these do not interfere with the national defense. If they are responsible for developing new equipment which has no civilian counterpart, and must depend on research which is not performed by the traditional consumer-producer team, the possibility that they will not be able to utilize commercial standards but will have to develop their own is increasingly great despite every policy and every desire to do otherwise.

Let me give you a few examples which point up a part of the problem, and in one case actually suggest a solution. I shall talk first about titanium.

Here is a metal of great promise because of its attractive strength-weight ratio in a temperature range from 400-800 F. This is extremely important in the design and construction of high-speed weapons which encounter thermal heating through air friction. This industry is currently in the throes of a plant expansion supported by government funds because of its great military potential. Because of the complexities of trying to schedule increased production and increased consumption, there is currently a stockpile in the system to store for later use any production surges. Titanium purchased for the stockpile is in the form of a sponge which is a loosely bonded assembly of metal that looks very much like coke. The quality of the alloy prepared from sponge depends in part on the quality of the sponge and, therefore, in order to sell material for the stockpile, it must pass certain specification requirements.

It would be highly desirable to have these specifications sufficiently complete to define a grade of material that not only can be prepared under existing technology, but also which will meet the application requirements of the future. Unless this end is attained to some measure at least, we face the possibility of presently producing and stockpiling hundreds of tons of material which may not be useful in the future. Unfortunately there are no well established simple procedures for determining the major impurities; oxygen, nitrogen, and carbon. The available methods are time consuming, complex, and incompletely standardized, and production workers and investigators are loathe to devote the time and effort required to use them. As a partial substitute, the Brinell hardness of a fused sample of the sponge prepared under controlled conditions is used, since there is a qualitative relationship between sponge purity and the measured hardness. The hardness requirement has changed with improved technology of production and growing awareness of the importance of sponge purity in the end uses of the metal. Initially, a hardness value

of 225 Brinell was considered satisfactory, later this was dropped to 200, and more recently will be set at 180 Brinell. Currently this standard is under study by a task group of ASTM Committee B-2. It is apparent that this group must have knowledge of the current research and development work under way on the production, and also on the application of titanium, in order to arrive at useful and proper standards.

My second example lies in the field of materials for use at elevated temperatures, particularly in gas turbines. The Minerals and Metals Advisory Board has recently made an exhaustive study of this problem with a view toward suggesting the direction of government-sponsored research. We have developed certain facts and opinions from the leading researchers throughout the country which indicate that the tremendous flood of government-sponsored research has not been matched by corresponding expansion of the experimental fabrication, testing, and evaluation of the country.

There are some indications that we have available at the present time in our research laboratories a large variety of experimental alloys which will saturate the testing facilities of the country for two or three years. During this period, of course, continued research would lead to still newer and better alloys, likewise requiring evaluation. Currently, we are dependent on the testing of materials in running engines as fabricated components. We do not yet understand enough about the design and operating conditions to be able to tell without testing what to expect of a new material as far as actual performance is concerned.

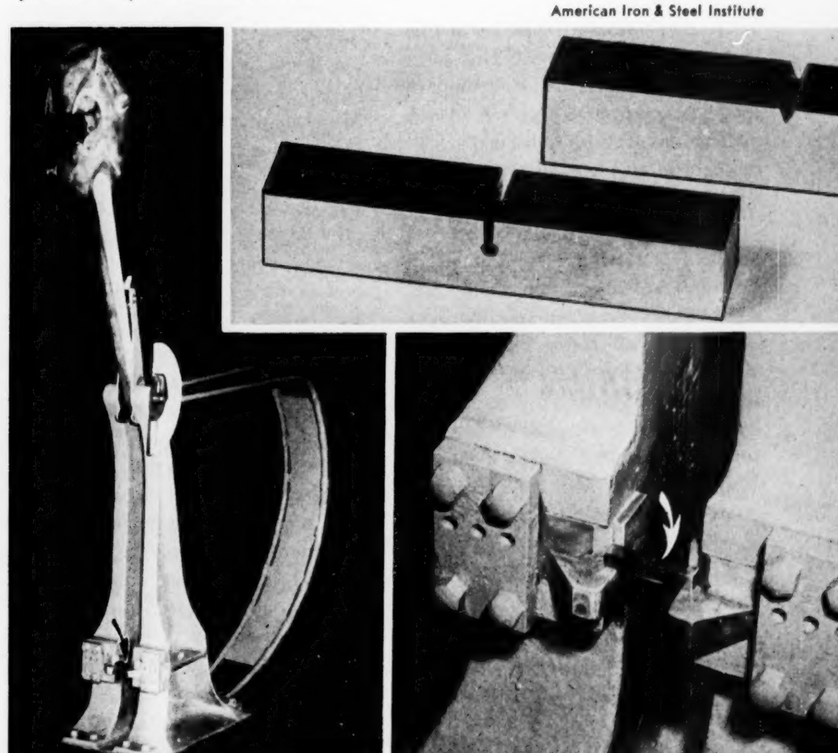
We are engaged in a very great research effort studying the micromechanism of fracture, studying thermal-gradients, radiation, and surface corrosion. Whether there are in these new researches findings of importance to the producer of materials and the consumer cannot be established with certainty. The consumer and the producer are so completely preoccupied with practical problems they face, that they may not be able to take the time required to analyze and interpret the findings of science. In normal times, we would say, "This is perfectly all right; we cannot force developments of this kind. We must allow the necessary time for the new findings to percolate through the economy." But these are not normal times. Currently, gas turbines are being made of alloys of cobalt, nickel, and chromium, with additions of columbium, tungsten, and molybdenum. Use of current alloys will place an excessive load on available supplies of certain critical metals under full mobilization. The research findings in the form of new alloys based on iron, and in the form of increased understanding of flow and fracture which can contribute to a better coordination of laboratory test and service performance are essential to the application of less highly alloyed materials, and every avenue must be explored to expedite use of research data in this field.

Of course we cannot overlook the desirability of standardization. Currently there are more than 300 alloys being used, whereas it may be that 50 would suffice, and a reduction in number would probably bring in more sources, that is, a greater variety of producers. This important function of such groups as ASTM, AISI, and ASA can probably be carried on with the same approach that has always been used.

The final case I should like to speak of concerns the fracture of welded ships and other welded structures. Again, this problem arose because of the pressure of full mobilization. When World War II started, we found ourselves with an insufficient number of cargo-carrying ships. Production of the standard types then in existence was not feasible at a rate sufficient to meet the military program. We were forced to adopt a design which had not been fully evaluated, to use in production welders who were not completely trained, and to incorporate materials whose performance in welded structures had

The Charpy impact test is now being used to test armor failure under severe winter conditions—(left) the Charpy tester; (right top) test specimen; (right) specimen in position—see arrow.

American Iron & Steel Institute



not been fully evaluated. With regard to the design problem, immediately on study of the first failure, design improvements leading to reduced stress concentrations were incorporated. With regard to welding and welders, it is almost certain that there will always be failures, that is, areas of incomplete fusion, because of the miles of welding bead which must be deposited under conditions of outdoor exposure, cramped working conditions, and other variables which cannot be controlled.

In order to consider the problem of material performance, a group of steel makers, ship designers, ship builders, and research investigators were assembled and given the problem of investigating the properties of ship steel. This group is now known as the Ship Steel Committee of the National Research Council. It required several years to determine what to do in regard to improvements. Those responsible for the analysis of ship failures made an early, wise decision to send samples of the fractured plates to a laboratory for study. At that laboratory, I can well imagine that the testing of the first plate was watched with bated breath in the hope that the material would be deficient according to normal specifications. This hope was not realized. Every standard specification test was passed by the material, and this continued to be the case in all plates that were tested subsequently.

In considering the relation between material quality and the failures, it became necessary to adopt new tests. At this very time, exploratory work on failures of armor under severe winter conditions have indicated the usefulness of the Charpy impact test conducted over a range of temperatures in studying brittle behavior. This technique was applied to the study of ship plate with immediate success.

During the past ten years there have been 250 Group 1, and 1200 Group 2 casualties. The categories refer to the degree of damage incurred, but both of these categories include long running cracks. To date, Charpy impact tests have been made on 45 plates containing the source of fracture, 51 plates which were fractured through, and 40 plates containing the end of fracture. In this test, ship plate which is normally considered to be ductile, becomes brittle over a temperature range called "the transition range." In this study the temperature at which the energy falls to 15-foot pounds, is known as the "transition temperature." The average transition temperatures of these three groups of plates are as follows:

Source plates	99 F
Through plates	67 F
End plates	53 F

It has been demonstrated that there is a definite statistical significance to these differences. Research under the auspices of the Ship Steel Committee or coordinated with it has shown that a decrease in carbon content of 0.01 percent will decrease transition temperature by 5F and an increase in maganese content of 0.01 percent with decrease transition temperature about 1 F. Based on this information, participating members of the Ship Steel Committee modified specifications for ship plate in an attempt to lower its transition temperature. It has not yet been agreed that the specifictaion for ship plate should include an impact test requirement, but if one were introduced, it could be based on a sound body of data; for example, the temperature of the ships at the time of failure is known in many cases. In the impact test it has been demonstrated that the energy absorbed by a test bar taken from a source plate at ship-failure temperature never exceeds about 11 foot pounds.

A small committee was recently established to determine what additional steps were necessary in the ship fracture problem. This group recommended that an effort be made to translate the impact test values into engineering terms, so that the designer could limit stresses to a value below that at which the material would fracture. An independent research effort reported to the Ship Steel Committee within weeks after the recommendation of this group demonstrated that there is a possibility for such engineering design data to be obtained on materials which fail in a brittle fashion, and there is currently a project aimed at solution of this final problem. The fact that this integrated program has been sponsored and participated in by the three important groups in the making of ships, that is, the steel producers, the ship builders, and the designers, has made possible the immediate utilization of research findings.

In these three examples I have by no means explored all of the problems encountered in control of metallurgical standards. The adoption of true requirements is a subject which could have been discussed at length. The incorporation of the right test likewise is a topic including a multitude of sins, of both commission and omission. Furthermore, I have not covered the many areas of physical science aside from metallurgy. However, I believe I have shown you that the traditional approach to standards and specifications is not likely to insure utilization and application of a very extensive portion of the research effort now in progress in this country under government sponsorship.

As a nation, we cannot afford to dissipate the findings of one-third of our research investigators. The problem of integrating industrial and government programs is staggering. And yet a happy solution would benefit the entire economy. The written record is far too extensive to be analyzed and interpreted by a group which has not participated actively in the writing of the record. I suggest that you have a responsibility to seek out the sources of the new information and to invite the active participation of investigators who can contribute both ideas and data. They can easily be encompassed within the current committee structure as part of the general interest group. You may find them advocating concepts which you must modify for very practical reasons. But at least you will have available to you through these individuals, immediate access to the latest findings of science and your standards and specifications can reflect—not the dead past, but the living present.

Does Industry Want American Standard Tables of Recommended Fits?

by John Gaillard

As mechanical engineer on the ASA staff, Dr Gaillard has closely followed for a number of years the development of national and international standards for Limits and Fits. During World War II he was secretary of the ASA War Committee on this subject and, later, secretary of the ABC Conferences in Ottawa (1945) and New York (1952 and 1953).

IF industry wants to have available, for use by its designers of mechanical and other equipment, American Standard tables of fits between cylindrical parts, it should soon have an opportunity to say so. At a conference held in February between representatives from industry and the military services in the United Kingdom, Canada, and the United States, agreement was reached on a Draft Proposal of an ABC System of Limits and Fits, recommended as a common basis for any national standards that are established in each of the three countries. Therefore, ASA sectional committee B4, on Allowances and Tolerances for Cylindrical Parts and Limit Gages, is expected to canvass American industry in the near future to find out:

(1) whether industry wants American Standard tables of recommended fits, and

(2) if so, whether tables of fits, based on the proposed ABC System will be satisfactory.

For the information of those interested, ASA has published the ABC Proposal. The history of its development and its contents are briefly reviewed in the present article.[1]

Tentative American Standard B4a-1925

In 1925 the American Standards Association approved the Tentative American Standard B4a-1925, Tolerances, Allowances and Gages for Metal Fits, developed by a committee organized under the sponsorship of the American Society of Mechanical Engineers. In addition to Fundamentals and Definitions, this standard presented a Classification of Fits, comprising eight recommended hole-shaft combinations, each designated by a class number and a name. The fits ranged from a Class 1, or "free" fit, to a Class 8, or "heavy force and shrink" fit. Each fit was specified, for a given range of nominal sizes of the mating parts, by the limits of the hole and the shaft. In addition, the tables listed, for each fit, the minimum and maximum looseness or tightness that might occur when holes and shafts, held within their specified limits, are assembled.

The 1925 standard did not confine the designer to the use of the hole-shaft combinations tabulated as recommended fits. He could also combine a hole and a shaft belonging to different classes. For example, a Class 2 fit (see Fig. 1), listed as the combination between a Class 2 hole and a Class 2 shaft, was characterized, for a given nominal size, by specific minimum and maximum clearances. If the designer required a fit with the same minimum clearance, but less maximum clearance, he could use the combination of a Class 3 hole with a Class 2 shaft.

In spite of this facility to cross-mate holes and shafts of different classes, the 1925 standard was not complete enough to cover the large variety of fits required by different branches of industry. For this and other reasons, ASA committee B4 was reorganized by the ASME in 1930 to consider a revision of B4a-1925.

Revision of B4a-1925

After the U. S. had entered World War II, ASA received a joint request from industry and the Government asking that the revision of B4a-1925 be promptly completed and supplemented with specifications for gagemaker's tolerances and permissible gage wear. A special ASA War Committee on Limits and Fits was organized in 1943 and started work on the subject.

Also in 1943, the first American-British-Canadian, or ABC Conference was held in New York, to consider the possibility of unifying some of the important standards in the engineering field, such as those for screw threads, and for fits between cylindrical parts. In the latter field, the combination of proposals developed by the ASA War Committee and a committee of the British Standards Institution resulted in 1945 in a proposed American War Standard, Limits and Fits for Engineering and Manufacturing.[2] However, the ASA War Committee decided not to submit this proposal to ASA for approval as an American War Standard, but to refer it to the regular ASA committee B4 to be used as a basis for its further work on the revision of B4a-1925, after the war.

ABC Agreement on Fundamentals in 1945

In October 1945, delegates from the British Standards Institution, the Canadian Standards Association, and the American Standards Association agreed, at a meeting in New York, on a number of fundamental features of a national standard for limits and fits. These include a series of definitions; recognition of the basic hole system and the basic shaft system; the reference temperature of 68 F or 20 C; and a table of recommended values for tolerances and allowances.

Developments of ABC Work

Basing on these fundamentals,

[1] Copies of the ABC Proposal (75 cents a copy) and the present article (25 cents a copy) may be obtained from the American Standards Association, Incorporated, 70 East 45th Street, New York 17, N. Y.

[2] Draft Specification B4.1, August 31, 1945.

ASA committee B4 developed a partial revision of B4a-1925, which was approved as American Standard B4.1-1947, Limits and Fits for Engineering and Manufacturing (Part I). This standard also contains a series of Preferred Basic Sizes from 0.0100 to 4 in., inclusive. It does not give tables of recommended fits, ASA committee B4 having decided that the compilation of such data required further study, the results of which were to be published as Part II of the revised standard. The British Standards Institution undertook a revision of its standard adopted in 1924 (B.S. 164:1924) and the Canadian Standards Institution started the development of a draft of a Canadian Standard which went through several revisions. Both proposals, the British and the Canadian, included tables of recommended fits.

In June, 1952, another ABC Conference was held in New York, prior to which the British and Canadians circulated their proposals. In the U.S. no draft of Part II of B4.1-1947 had been developed as yet. However, shortly before the ABC Conference, ASA committee B4 declared its willingness to circulate the Canadian proposal to American industry for comment and criticism.

At the June, 1952, ABC Conference, it was found that the British and Canadian proposals had so much in common that an effort should be made to unify them, and steps in this direction were unanimously approved by the three delegations. In September, 1952, the British and Canadians, at a meeting in London, reached agreement on the basic features of a common new proposal of an ABC System. Accordingly, the Canadians circulated a new draft of their proposed Canadian Standard (Fifth draft, October 31, 1952) and the British submitted a "Draft Proposal for an ABC System of Limits and Fits (Third Draft, November 25, 1952)" presenting the basic features of the proposed unified system in a simple form.

At a meeting held in December, 1952, ASA committee B4 discussed the new Canadian draft. Although some of its features were criticized, committee B4 declared that it was willing to distribute this draft, with such amendments as might be adopted at the coming ABC Conference, to American industry for comment and criticism. This attitude was taken with a view to the committee's previous decision regarding distribution of the earlier Canadian draft. The new British proposal had not yet been received by committee B4 and therefore was not discussed.

ABC Conference February 1953

The new British and Canadian proposals were considered by the ABC Conference in New York, February 1953, which was attended, as were the previous conferences, by delegations from the three countries. These delegations consisted of members of the technical committees organized by their national standards bodies, and representatives of their Armed Forces. In a two-day session complete agreement was reached on a "Draft Proposal for an ABC System of Limits and Fits, Fourth Draft, February 1953." This is the document now published by ASA for the information of American industry.[1] The three delegations agreed to recommend the technical content of this new ABC Proposal to their respective standards organizations as the basis of such national standards for Limits and Fits as each of the three countries might decide to establish. The form, arrangement, and symbols of such standards was left to their individual preference. (The ABC Proposal uses the British arrangement, symbols, etc, as a means of illustrating the recommended limits and fits.) The American delegation stated that it would be necessary first to determine whether industry in this country really wanted to have an American Standard containing tables of recommended fits, or whether the general opinion was that the specification of fits should be worked out by the designer in each individual case. The American delegation made it clear that for the time being it could not definitely say that an American Standard would be set up, but if this were done, it agreed to recommend a standard in accordance with the technical content of the ABC Proposal. There were indications that the British and Canadians expected to complete their own national standards on the ABC basis in the near future.

The ABC System of Limits and Fits

Complete details of the ABC System are given in the ASA publication of the Draft Proposal previously mentioned.[1] The main features are:

(1) A table of fundamental tolerances for holes and shafts in nominal sizes up to about 20 in. These tolerances are classified into ten grades, numbered from 4 to 13, whose step-up closely follows the 5-series of Preferred Numbers.[3] For example, a Grade 7 tolerance on a hole or shaft is about 60 percent larger than the Grade 6 tolerance.

(2) A series of holes, each designated in the document, using the British symbols for illustration, by a capital letter indicating the position of its tolerance zone relative to the basic size, and a numeral indicating the grade of its tolerance. For example, in Table 1, hole H6, which is one of a series of basic holes (tolerance basic to plus), has a Grade 6 tolerance. For a one-inch hole, this grade corresponds to a tolerance of 0.0005 in. Therefore, the limits of one-inch hole H6 are 1.0000 and 1.0005 in.

(3) A series of shafts, each similarly designated by a lower-case letter indicating the position of its tolerance zone relative to the basic size, and a numeral indicating the grade of its tolerance. As shown in Table 1, shaft d8 has a maximum limit which is below basic and a Grade 8 tolerance. For a one-inch shaft d8 the limits are 0.9975 and 0.9963 in.

(4) Tables of recommended fits, in which each fit is designated by a symbol and specified in terms of two limits for the hole, and two for the shaft. For example, the combination of a hole H9 and a shaft d8 will result in a fit which is designated in British practice by H9-d8, and in Canadian practice by the symbol

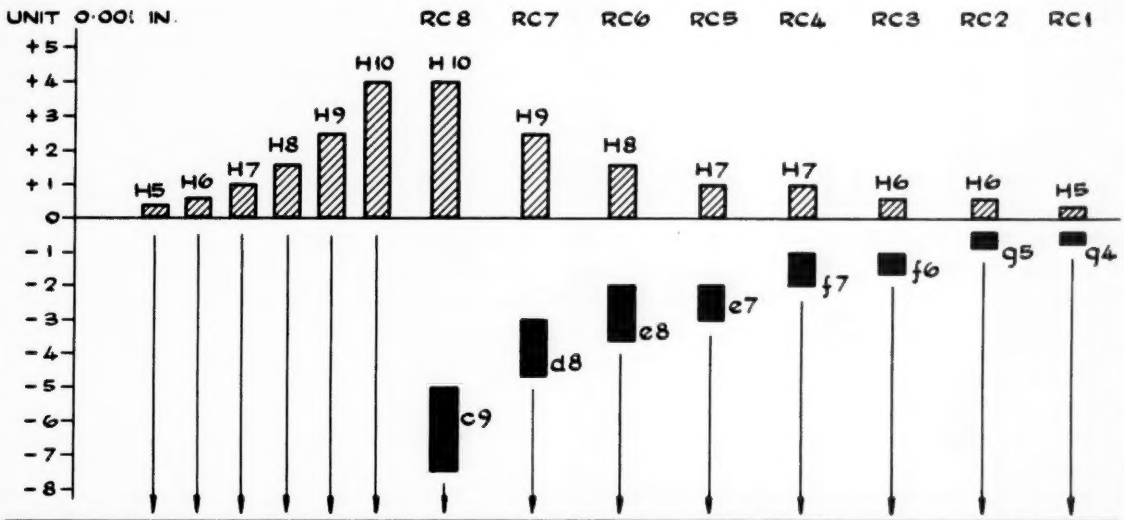
[3] See American Standard, Preferred Numbers, Z17.1-1936.

Table 1

This is a reproduction of a table of eight "running clearance" or RC fits given in the ABC Proposal. The distance of a hole or shaft limit above (+) or below (—) the basic size is given in units of 0.001 inch.

HOLES
SHAFTS

TO SCALE FOR 1·75 IN. DIA.
ALL TOLERANCES IN UNITS OF 0·001 IN.

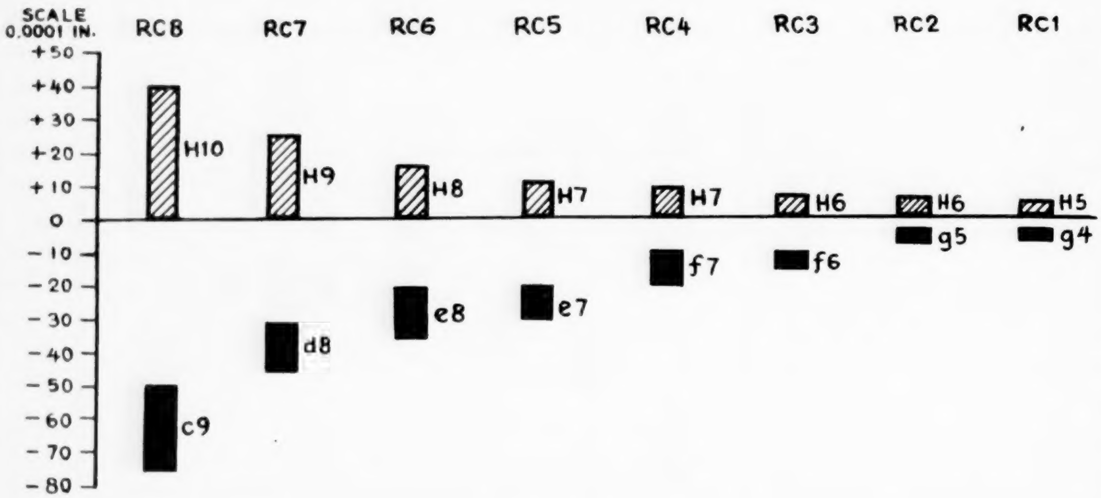


DIAMETERS OVER : TO (INS.)	HOLES						SHAFTS WITH HOLE H10		WITH HOLE H9		WITH HOLE H8		WITH HOLE H7		WITH HOLE H7		WITH HOLE H6		WITH HOLE H6		WITH HOLE H5	
	H5	H6	H7	H8	H9	H10	c9	fit*	d8	fit*	e8	fit*	e7	fit*	f7	fit*	f6	fit*	g5	fit*	g4	fit*
·04 – ·12	+·2 +·0	+·25 +·0	+·4 +·0	+·6 +·0	+1·0 +·0	+1·6 +·0	-2·5 -3·5	+2·5 +5·1	-1·0 -1·6	+1·0 +2·6	-·6 -1·2	+·6 +1·8	-·6 -1·0	+·6 +1·4	-·3 -·7	+·3 +1·1	-·3 -·55	+·3 +·8	-·1 -·3	+·1 +·55	-·1 -·25	+·1 +·45
·12 – ·24	+·2 +·0	+·3 +·0	+·5 +·0	+·7 +·0	+1·2 +·0	+1·8 +·0	-2·8 -4·0	+2·8 +5·8	-1·2 -1·9	+1·2 +3·1	-·8 -1·5	+·8 +2·2	-·8 -1·3	+·8 +1·8	-·4 -·9	+·4 +1·4	-·4 -·7	+·4 +1·0	-·15 -·35	+·15 +·65	-·15 -·3	+·15 +·5
·24 – ·40	+·25 +·0	+·4 +·0	+·6 +·0	+·9 +·0	+1·4 +·0	+2·2 +·0	-3·0 -4·4	+3·0 +6·6	-1·6 -2·5	+1·6 +3·9	-1·0 -1·9	+1·0 +2·8	-1·0 -1·6	+1·0 +2·2	-·5 -1·1	+·5 +1·7	-·5 -·9	+·5 +1·3	-·2 -·45	+·2 +·85	-·2 -·35	+·2 +·6
·40 – ·71	+·3 +·0	+·4 +·0	+·7 +·0	+1·0 +·0	+1·6 +·0	+2·8 +·0	-3·5 -5·1	+3·5 +7·9	-2·0 -3·0	+2·0 +4·6	-1·2 -2·2	+1·2 +3·2	-1·2 -1·9	+1·2 +2·6	-·6 -1·3	+·6 +2·0	-·6 -1·0	+·6 +1·4	-·25 -·55	+·25 +·95	-·25 -·45	+·25 +·75
·71 – 1·19	+·4 +·0	+·5 +·0	+·8 +·0	+1·2 +·0	+2·0 +·0	+3·5 +·0	-4·5 -6·5	+4·5 +10·0	-2·5 -3·7	+2·5 +5·7	-1·6 -2·8	+1·6 +4·0	-1·6 -2·4	+1·6 +3·2	-·8 -1·6	+·8 +2·4	-·8 -1·3	+·8 +1·8	-·3 -·7	+·3 +1·2	-·3 -·55	+·3 +·95
1·19 – 1·97	+·4 +·0	+·6 +·0	+1·0 +·0	+1·6 +·0	+2·5 +·0	+4·0 +·0	-5·0 -7·5	+5·0 +11·5	-3·0 -4·6	+3·0 +7·1	-2·0 -3·6	+2·0 +5·2	-2·0 -3·0	+2·0 +4·0	-1·0 -2·0	+1·0 +3·0	-1·0 -1·6	+1·0 +2·2	-·4 -·8	+·4 +1·4	-·4 -·7	+·4 +1·1
1·97 – 3·15	+·5 +·0	+·7 +·0	+1·2 +·0	+1·8 +·0	+3·0 +·0	+4·5 +·0	-6·0 -9·0	+6·0 +13·5	-4·0 -5·8	+4·0 +8·8	-2·5 -4·3	+2·5 +6·1	-2·5 -3·7	+2·5 +4·9	-1·2 -2·4	+1·2 +3·6	-1·2 -1·9	+1·2 +2·6	-·4 -·9	+·4 +1·6	-·4 -·7	+·4 +1·2
3·15 – 4·73	+·6 +·0	+·9 +·0	+1·4 +·0	+2·2 +	+3·5 +	+5·0 +	-7·0 -10·5	+7·0 +16·5	-5·0 -7·2	+5·0 +10·7	-3·0 -5·2	+3·0 +7·4	-3·0 -4·4	+3·0 +5·8	-1·4 -2·8	+1·4 +4·2	-1·4 -2·3	+1·4 +3·2	-·5 -1·1	+·5 +2·0	-·5 -·9	+·5 +1·5
4·73 – 7·09	+·7 +·0	+1·0 +·0	+1·6 +·0	+2·5 +·0	+4·0 +·0	+6·0 +·0	-8·0 -12·0	+8·0 +18·0	-6·0 -8·5	+6·0 +12·5	-3·5 -6·0	+3·5 +8·5	-3·5 -5·1	+3·5 +6·7	-1·6 -3·2	+1·6 +4·8	-1·6 -2·6	+1·6 +3·6	-·6 -1·3	+·6 +2·3	-·6 -1·1	+·6 +1·8
7·09 – 9·85	+·8 +·0	+1·2 +·0	+1·8 +·0	+2·8 +·0	+4·5 +·0	+7·0 +·0	-10·0 -14·5	+10·0 +21·5	-7·0 -9·8	+7·0 +14·3	-4·0 -6·8	+4·0 +9·6	-4·0 -5·8	+4·0 +7·6	-2·0 -3·8	+2·0 +5·6	-2·0 -3·2	+2·0 +4·4	-·6 -1·4	+·6 +2·6	-·6 -1·2	+·6 +2·0

* THE FIT IS THE MAXIMUM AND MINIMUM DIFFERENCE IN SIZE OF HOLE AND SHAFT, + DENOTING CLEARANCE AND – INTERFERENCE.

Table 2

The eight RC fits shown in Table I are represented here by placing the hole and shaft date for each fit in adjacent columns. The distance of a hole or shaft limit above (+) or below (—) the basic size is given here in units of 0.0001 inch.



Nominal sizes (in inches)		RC8			RC7			RC6			RC5			RC4			RC3			RC2			RC1		
Over	To .... incl	Hole H10	Shaft c9	Min and max clearance	Hole H9	Shaft d8	Min and max clearance	Hole H8	Shaft e8	Min and max clearance	Hole H7	Shaft e7	Min and max clearance	Hole H7	Shaft f7	Min and max clearance	Hole H6	Shaft f6	Min and max clearance	Hole H6	Shaft g5	Min and max clearance	Hole H5	Shaft g4	Min and max clearance
·04	·12	+16 +0	−25 −35	25 51	+10 +0	−10 −16	10 26	+6 +0	−6 −12	6 18	+4 +0	−6 −10	6 14	+4 +0	−3 −7	3 11	+2.5 +0	−3 −5.5	3 8	+2.5 +0	−1 −3	1 5·5	+2 +0	−1 −2·5	1 4·5
·12	·24	+18 +0	−28 −40	28 58	+12 +0	−12 −19	12 31	+7 +0	−8 −15	8 22	+5 +0	−8 −13	8 18	+5 +0	−4 −9	4 14	+3 +0	−4 −7	4 10	+3 +0	−1·5 −3·5	1·5 6·5	+2 +0	−1·5 −3	1·5 5
·24	·40	+22 +0	−30 −44	30 66	+14 +0	−16 −25	16 39	+9 +0	−10 −19	10 28	+6 +0	−10 −16	10 22	+6 +0	−5 −11	5 17	+4 +0	−5 −9	5 13	+4 +0	−2 −4·5	2 8·5	+2·5 +0	−2 −3·5	2 6
·40	·71	+28 +0	−35 −51	35 79	+16 +0	−20 −30	20 46	+10 +0	−12 −22	12 32	+7 +0	−12 −19	12 26	+7 +0	−6 −13	6 20	+4 +0	−6 −10	6 14	+4 +0	−2·5 −5·5	2·5 9·5	+3 +0	−2·5 −4·5	2·5 7·5
·71	1·19	+35 +0	−45 −65	45 100	+20 +0	−25 −37	25 57	+12 +0	−16 −28	16 40	+8 +0	−16 −24	16 32	+8 +0	−8 −16	8 24	+5 +0	−8 −13	8 18	+5 +0	−3 −7	3 12	+4 +0	−3 −5.5	3 9·5
1·19	1·97	+40 +0	−50 −75	50 115	+25 +0	−30 −46	30 71	+16 +0	−20 −36	20 52	+10 +0	−20 −30	20 40	+10 +0	−10 −20	10 30	+6 +0	−10 −16	10 22	+6 +0	−4 −8	4 14	+4 +0	−4 −7	4 11
1·97	3·15	+45 +0	−60 −90	60 135	+30 +0	−40 −58	40 88	+18 +0	−25 −43	25 61	+12 +0	−25 −37	25 49	+12 +0	−12 −24	12 36	+7 +0	−12 −19	12 26	+7 +0	−4 −9	4 16	+5 +0	−4 −7	4 12
3·15	4·73	+50 +0	−70 −105	70 155	+35 +0	−50 −72	50 107	+22 +0	−30 −52	30 74	+14 +0	−30 −44	30 58	+14 +0	−14 −28	14 42	+9 +0	−14 −23	14 32	+9 +0	−5 −11	5 20	+6 +0	−5 −9	5 15
4·73	7·09	+60 +0	−80 −120	80 180	+40 +0	−60 −85	60 125	+25 +0	−35 −60	35 85	+16 +0	−35 −51	35 67	+16 +0	−16 −32	16 48	+10 +0	−16 −26	16 36	+10 +0	−6 −13	6 23	+7 +0	−6 −11	6 18
7·09	9·85	+70 +0	−100 −145	100 215	+45 +0	−70 −98	70 143	+28 +0	−40 −68	40 96	+18 +0	−40 −58	40 76	+18 +0	−20 −38	20 56	+12 +0	−20 −32	20 44	+12 +0	−6 −14	6 26	+8 +0	−6 −12	6 20

RC7. This means that it is No. 7 of the recommended RC fits, a group of *clearance* fits (hence the C) intended to be used where *running* fits are required (hence the R). The RC fits are given in Table 1 for a range of nominal sizes from over 0.04 to 9.85 in., inclusive.[4]

The ABC Proposal gives similar tables for LC or "locational clearance" fits which are intended for parts that have merely to be kept in position relative to each other, as in the case of parts which are normally stationary. Still other ABC tables give series of transition and interference fits. All of these types of fits have been chosen as recommended combinations of ABC holes and shafts picked from the series mentioned above under (2) and (3).

With a view to the wide use of ball and roller bearings, the ABC Proposal also contains a table of fits between such bearings and the shafts and housings with which they are assembled. The tables of ABC fits together are believed to meet the large majority of requirements of industry in general.

[4] Table 1 in the present article is a reproduction of Table II, Sheet 2, of the ABC Proposal.

Tables of Fits in a National Standard

Being a document primarily intended to serve as the basis for setting up national standards, the ABC Proposal presents its data in a compact form, as shown by Table 1. This contains all of the data needed by the designer to specify RC fits, but these data are not presented in a form most convenient for practical use. For example, with one exception (RC8), the limits for the hole and the shaft are given in columns which are not adjacent. In a national standard, such data should be preferably arranged in such a way as to make their use by the designer easier. For example, Table 1 could be rearranged as shown in Table 2. Here, the limits for each fit are found in adjacent columns. Also, since it is common practice in American industry to express such limits in tenthousandths of an inch ("tenths"), the values in Table 2 are given in this unit.

Tables of Fits for Company Use

A single manufacturer will seldom need all of the fits tabulated in a national standard. For example, if we assume that Table 2 were part of an American Standard, an individual company might be interested, with a view to its present manufacturing problems, only in the four RC fits framed in heavy lines, in Table 2: RC8, RC7, RC5, and RC3.

Also, the company might use these fits only in the range of nominal sizes, say, from 1/8 to 2 in., inclusive. For its own use, the company could then adopt a table containing no more than the data of direct interest to its designers, see Table 3. The limits are given here in inches which makes them still easier to read than those in Table 2.

Fits in Basic Shaft System

In practice, most fits are specified in the Basic Hole System, but some industries for good reasons prefer the Basic Shaft System. One of the criticisms leveled at the old standard B4a-1925 was that it did not provide for any fits of the latter kind. Although the ABC Proposal does not give tables of fits in the Basic Shaft System, it permits the designer to specify such fits by combining basic shafts, and holes to match, from the ABC tables of holes and shafts. To illustrate this, Fig. 1 shows the four RC fits of Table 3, graphically represented for the nominal size 0.75 in.,

Table 3

A manufacturer whose products call only for RC fits framed in heavy lines in Table 2 may tabulate these fits, as part of a company standard, in the simpler way shown here.

DIMENSIONS IN INCHES

NOMINAL SIZE		FIT RC7			FIT RC6			FIT RC5			FIT RC3		
OVER	TO INCL	HOLE H9	SHAFT d8	MIN AND MAX CLEARANCE	HOLE H8	SHAFT e8	MIN AND MAX CLEARANCE	HOLE H7	SHAFT e7	MIN AND MAX CLEARANCE	HOLE H6	SHAFT f6	MIN AND MAX CLEARANCE
0.12	0.24	+0.0012 0	−0.0012 −0.0019	0.0012 0.0031	+0.0007 0	−0.0008 −0.0015	0.0008 0.0022	+0.0005 0	−0.0008 −0.0013	0.0008 0.0018	+0.0003 0	−0.0004 −0.0007	0.0004 0.0010
0.24	0.40	+0.0014 0	−0.0016 −0.0025	0.0016 0.0039	+0.0009 0	−0.0010 −0.0019	0.0010 0.0028	+0.0006 0	−0.0010 −0.0016	0.0010 0.0022	+0.0004 0	−0.0005 −0.0009	0.0005 0.0013
0.40	0.71	+0.0016 0	−0.0020 −0.0030	0.0020 0.0046	+0.0010 0	−0.0012 −0.0022	0.0012 0.0032	+0.0007 0	−0.0012 −0.0019	0.0012 0.0026	+0.0004 0	−0.0006 −0.0010	0.0006 0.0014
0.71	1.19	+0.0020 0	−0.0025 −0.0037	0.0025 0.0057	+0.0012 0	−0.0016 −0.0028	0.0016 0.0040	+0.0008 0	−0.0016 −0.0024	0.0016 0.0032	+0.0005 0	−0.0008 −0.0013	0.0008 0.0018
1.19	1.97	+0.0025 0	−0.0030 −0.0046	0.0030 0.0071	+0.0016 0	−0.0020 −0.0036	0.0020 0.0052	+0.0010 0	−0.0020 −0.0030	0.0020 0.0040	+0.0006 0	−0.0010 −0.0016	0.0010 0.0022
1.97	3.15	+0.0030 0	−0.0040 −0.0058	0.0040 0.0088	+0.0018 0	−0.0025 −0.0043	0.0025 0.0061	+0.0012 0	−0.0025 −0.0037	0.0025 0.0049	+0.0007 0	−0.0012 −0.0019	0.0012 0.0026

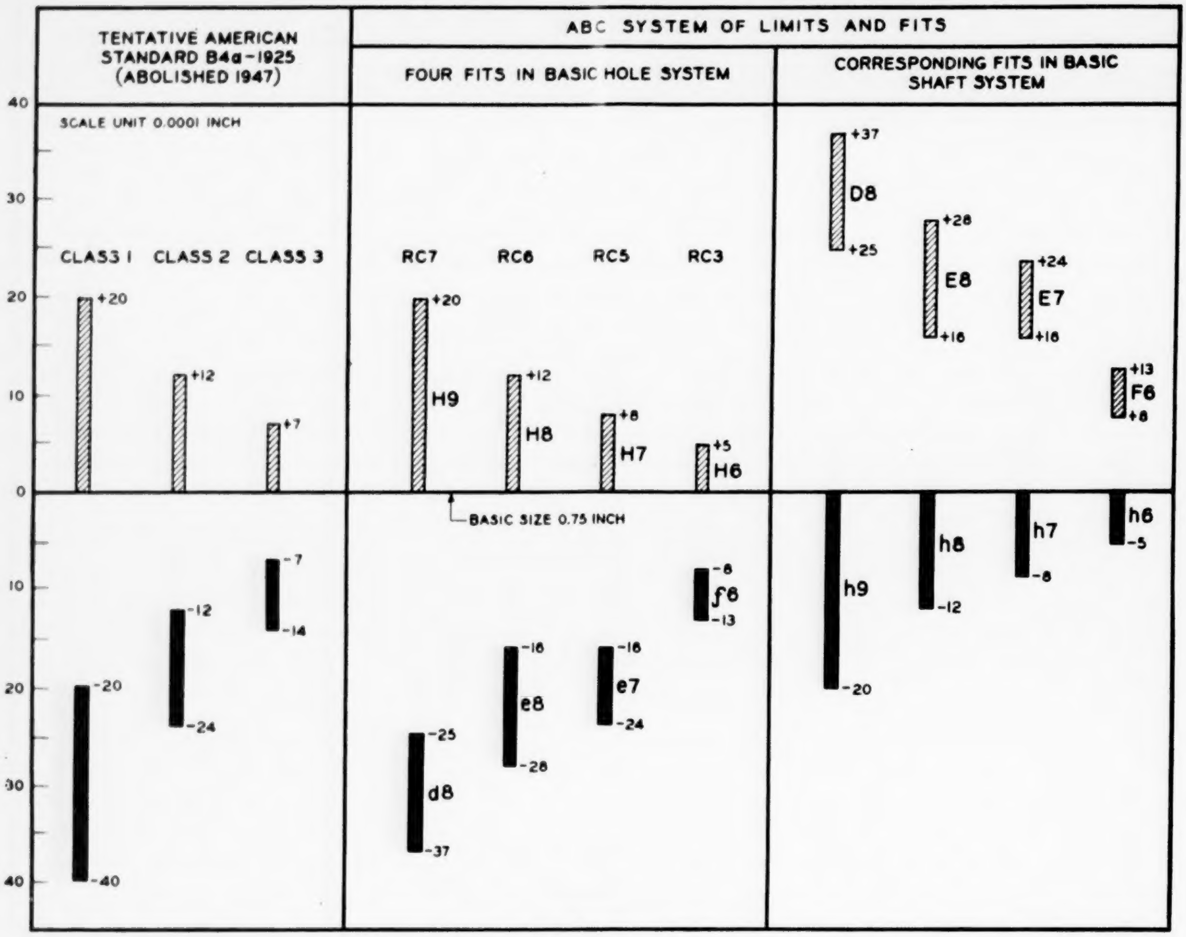


Figure 1

The four RC fits given in Table 3 (Basic Hole System) are represented here by bar diagrams, for a hole and shaft with a nominal size of 0.75 in. The corresponding ABC fits in the Basic Shaft System are shown on the right side and the Classes 1, 2, and 3 fits of B4a-1925, for comparison, on the left.

together with the corresponding fits in the Basic Shaft System. For comparison, the fits, Classes 1, 2, and 3, according to the former B4a-1925, are also shown.

Variety of Fits

If a national standard and, therefore, the ABC System as the basis for such a standard, is to be effectively used by different industries, it must provide a large variety of fits to meet the functional requirements of the products made by these industries. This means that in principle the standard must give the designer a sufficient choice between holes and shafts in different grades of tolerances, as well as between different allowances for fits. On the other hand, practical experience has shown that the great majority of requirements of industry at large can be met by a rather limited choice of hole-shaft combinations. These are the fits which have been tabulated in the ABC Proposal. They are suggested to the designer as his first choice, to be used whenever he can do so. If designers will confine themselves as much as possible to these tabulated fits, this will tend to reduce the variety of tools and gages required to produce and inspect the components. Also, if the same fit is used over and over again, its standard designation (such as RC7 or H9-d8) will acquire a definite meaning for those engaged in problems of fit. On sketches and in notes the designer may indicate a fit simply by a symbol which will be translated on the workshop drawing into limits for the mating parts. Also, a symbol may be used to specify that a fit of a certain type applies to a number of hole-shaft assemblies having different nominal sizes. For example, if a drawing specifies fit RC7 for five assemblies, each having a different basic size, this indication is sufficient for finding in the ABC tables the limits for both parts of each assembly.

Evidently there will be cases where the designer does not find just what he needs in the ABC tables of fits. In such a case he should try to find, as a second choice, a combination of a hole and a shaft picked from the tables of ABC holes and shafts that will suit his purpose. Since the ABC Proposal offers a wide choice of allowances and tolerances, the chances are that this second choice will bring results. If not, and only then, the designer will have to specify limits for holes and shafts not covered by the ABC Proposal, that is, "specials." This should be necessary only in few cases. •

New Proposal on Lamp Ballasts

by E. H. Salter

EXPERIENCE in the use of the three proposed American Standards for fluorescent lamp ballasts, published in 1950 for trial and comment, has helped to clarify a number of points that are important to the user of fluorescent lamps. As explained in the article written at the time the first of the three proposed American Standards for lamp ballasts was published (STANDARDIZATION, June 1950, page 142), the characteristics of the operating circuit of a fluorescent lamp are largely those of the ballast or stabilizing element used with the lamp. This element will largely determine whether the lamp will start properly; whether it will deliver its rated light output; and whether it will operate for the expected number of hours—in short, whether it will give satisfactory service to the ultimate consumer.

Of the three proposed standards issued in 1950, two were for the purpose of defining the technique of measuring the characteristics of ballasts and the third was a performance specification for the ballasts themselves.

This latter standard had been a compromise specification, because of different opinions on specification requirements concerning ballast heating, lamp starting, and permissible distortion of the lamp current wave. It now has been given two years of trial, and has been revised to include many changes and additions that have been suggested as the result of experience with the earlier edition. Final recommendations have not yet been made, however, and the new edition is again being offered for trial use to develop further experience.

The changes in requirements for performance of ballasts incorporated in the new edition have been the result of more complete knowledge of the mechanics of lamp starting and operation. During this period, there also has developed a realization that many of the suspected differences in product apparently were more a reflection of difference in the techniques used in measuring, and of incomplete definition of circuit characteristics, than differences in the product itself.

The new edition is the result of intensive activity by several subcommittees working on these problems. Other phases are still under active investigation. Sectional Committee C82 is hoping that the new edition of the proposed American Standard specifications for fluorescent lamp ballasts, C82.1, will be given a trial by all interested groups in order that the new procedures can be properly evaluated.

Mr Salter is an engineer at the Electrical Testing Laboratories, New York, and is chairman of both the Sectional Committee on Fluorescent Lamp Ballasts, C82, and the Sectional Committee on Electric Lamps, C78.

Electrical Testing Laboratories, Inc

A technician of the Electrical Testing Laboratories tests performance of fluorescent lamp ballasts.

A MESSAGE FOR NOT-SO-LARGE COMPANIES

"If we have created the impression that standardization practices are only worth while and practical for the few who are associated with large companies, let us correct ourselves." This is S. E. Ringheim's observation in an article on the benefits of standardization addressed primarily to the smaller companies (*Cincinnati Purchasor*, March 1953). Mr. Ringheim is Purchasing Supervisor of the Crown Zellerbach Corp, Seattle, and chairman of District 1 of the National Association of Purchasing Agents' Standards Committee.

"If you set up some program for work procedure, you do it to save time—which, in a sense, is standardizing," he explains. "If you buy equipment for a new job that duplicates existing equipment, you, in a sense practiced standardization — it saved you investigating time, for you know its quality and that it will do the job—it was easier for the manufacturer to make for he had made it before, had the engineering done, patterns on hand, etc—it simplified your maintenance and renewal part problems, etc.

"The more you practice what is really commonsense in your buying, the more you will eliminate time and effort, save materials and expense, and that, in the final sense, is what we call standardization. Consider how few people have really worked on standardization up till now and view the benefits—let your imagination roam and try to visualize the benefits possible if we all work at it. We are now only asking that you and all others conscientiously work at this line of thinking and when you do, mass production, lower costs, new industries, better products, better living will really come into their own."

TOWARD UNIVERSAL METEOROLOGY SYMBOLS

by H. Wexler

Chairman, Subcommittee on Letter Symbols for Meteorology, Sectional Committee Y10

STANDARDIZATION of letter symbols for meteorology has been long overdue. Rapid expansion of meteorological science during World War II and continued development and application of this science during the post-war years have brought about a great deal of confusion and many conflicts in the use of letter symbols. Some semblance of standardization can be recognized due to long-time usage in certain areas of meteorological subject matter but, on the whole, letter symbols generally have been used according to the habits and whims of individual editors and authors.

Under these circumstances, the American Meteorological Society welcomed an opportunity in 1949 to form a Subcommittee on Letter Symbols for Meteorology under the auspices of the Sectional Committee on Letter Symbols and Abbreviations for Science and Engineering. The Society supported the work of the subcommittee in cooperation with the American Society of Mechanical Engineers. ASME is sponsor for the sectional committee under the procedure of the American Standards Association.

After consultation with numerous authorities in the field of meteorology, this subcommittee completed its draft of Proposed Standard Letter Symbols for Meteorology in June 1950 and submitted the draft to the sectional committee for approval. The subcommittee subsequently made a few minor changes on the basis of comments received through the sectional committee. The proposal was then approved by the sectional committee late in 1952, and has now been approved by the American Standards Association as the new American Standard on Letter Symbols for Meteorology.

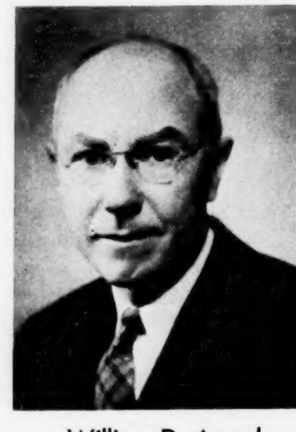
One of the most difficult problems faced by the subcommittee, of course, was to obtain general agreement on its proposal. Obviously, under the confused situation which has been described, this could not be done in many cases. Nevertheless, most persons who disagreed with particular symbols recognized the need for standardization and were willing to leave the differences to the subcommittee for final resolution.

The subcommittee recognizes that it has not solved many of the problems of standardizing meteorological symbols; however, it feels that it has produced a workable standard that will be helpful to authors and editors. It believes that the new standard will accomplish the following:

1. Provide authors and editors with a useful guide to symbol usage.
2. Uncover symbols requiring standardization that were overlooked by the subcommittee.
3. Uncover inconsistencies in symbol usage that escaped detection in preparation of the new standard.
4. Provide the starting point for a new standard that should be prepared within a few years after the present one has been subjected to the rigors of daily usage.
5. Provide a basis for developing a standard acceptable on a world-wide basis, perhaps under the auspices of the World Meteorological Organization.

It is the hope of the subcommittee that whoever may have occasion to use the new American Standard Letter Symbols for Meteorology will notify the subcommittee of any errors, omissions, inconsistencies, or other criticisms that should be considered in any future revision of the standard.

Copies of the American Standard Letter Symbols for Meteorology, Y10.10-1953, can be obtained from the ASA or ASME at $1.00 each.



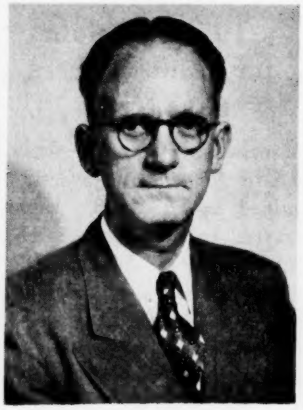
William D. Appel

STANDARDS

OUTSTANDING contributions to the public service, the nation, or humanity by members of the staff of the National Bureau of Standards are occasion for presentation of the Department of Commerce Exceptional Service Award. This year the award was earned by a number of men who have had an active part in the nation's standardization program. William D. Appel, Dr Gordon M. Kline, George N. Thompson, and Elmer Weaver were among those who received the Department of Commerce Gold Medal for their achievements.

Mr Appel has been a member of the staff of the Bureau since 1922. He is now chief of the textiles section of the organic and fibrous materials division. He is active in the work of the International Organization for Standardization on textiles and was chief of the American delegation to the ISO textile committee meetings in June 1952. He is chairman of ASA Committee L23 which is the U. S. Committee for coordinating the American viewpoint for presentation to ISO/TC 38 on Textiles.

Mr Appel received the Exceptional Service Award for his "outstanding contributions to textile chemistry, technology, and standards for many years at the National Bureau of Standards." The citation declares, "His pioneering work in the utilization of spectrophotometry in the in-



Dr Gordon M. Kline

George N. Thompson

MEN ARE HONORED

vestigation of dyes and dyeing led to a new approach to the problems of dyeing and fading of textiles and anticipated technological developments in textile dyeing." Concerning his work as chief of the textiles section, it continues, "The varied program of research and developmental work in the textiles section led to a whole series of testing machines and procedures that are widely used in research and in specifications and has maintained the National Bureau of Standards in a position of leadership in the rapidly developing technical activities in this field, both nationally and internationally."

Dr Kline received the gold medal award for his "major contributions to science and technology through pioneering work and accomplishments in the field of organic plastics and for distinguished authorship." Nomination for the award pointed to the fact that his recent appointment as chief of the organic and fibrous materials division is a tribute to his administrative abilities as well as his versatility, breadth of interest, and imagination. It continues, "Recognition of Dr Kline's international reputation in the field of plastics is shown by his selection as a representative to England to exchange information with plastics experts there regarding military applications of plastics during 1942 and his selection as the first chairman of the Technical Committee TC 61 of the International Organization for Standardization."

Dr Kline is credited with distinguished authorship for chapters on plastics in the *Encyclopedia Americana, Doubleday's Encyclopedia, Medical Physics*, and the *International Industry Yearbook*. He is technical editor of *Modern Plastics*, and is editorial director of the *Modern Plastics Encyclopedia* and *Engineers' Handbook*.

Mr Thompson was given recognition for his "rare and outstanding contributions to higher standards of housing through the development of model building codes." Mr Thompson has been a member of the staff of the National Bureau of Standards since 1924 and is now assistant chief of the building technology division. He has worked closely with the Construction Standards Board of the American Standards Association (formerly the Building Code Correlating Committee). He succeeded the late Rudolph P. Miller as chairman of the Board in 1944 and served in that capacity until March 1949.

"Mr Thompson's contributions to the national housing effort, industrial safety, and building materials development and standardization have achieved major proportions as factors in scientific and technical progress in these fields," his nomination declared. "His sound judgment, demonstrated capacity for original thinking, and successful dealing with complex questions and diverse points of view have led to his widespread recognition as an authority on building codes and to many demands on his services. His major contribution has been the scientific evaluation, clarification, and unification of building codes throughout the country.

"Mr Thompson has worked to bring to the attention of the code makers the significance of new developments in building materials, skillfully and tactfully stimulating those with whom he has come into contact into the reconciliation of conflicting viewpoints.

"In the bringing together of these conflicting viewpoints the particular qualities required are selflessness, complete honesty, the ability to see the other man's point of view, a firm belief in one's mission (but the willingness to make haste slowly), a strong technical background, and acquaintance with both laboratory results and practical problems. Mr Thompson possesses all of these qualities. Time after time his dispassionate and convincing discussions have led responsible persons and organizations to discount exaggerated or biased claims and to agree upon constructive programs for the betterment of building codes throughout the nation."

Mr Weaver was cited for "important basic contributions to the knowledge of the chemical behavior of gases." His major contributions have been the thermal conductivity method of gas analysis; now very extensively used in industry; the development of methods for designing gas burners and for testing domestic gas appliances for safety, efficiency, and durability. These methods are largely the basis for the American Gas Association Laboratory's approval of safe and efficient appliances in accordance with American Standard Approval Requirements. He also has contributed to research on the interchangeability of gases. Mr Weaver was a pioneer in demonstrating the soundness and advantages of the practice of purchasing gas on the basis of heating value.

The Manufacturers Standardization Society of the Valve and Fittings Industry Honors Howard Coonley for 40 Years of Service.

Recognizing the important role Howard Coonley has played in helping to organize and develop the standardization program of his industry, the Manufacturers Standardization Society of the Valve and Fittings Industry presented a scroll to Mr Coonley at its annual meeting March 11.

Mr. Coonley is known throughout the world as past-president of ASA and of the International Organization for Standardization. For many years before he became a world figure in standardization, he was president of the Walworth Company, one of the country's great producers of valves and fittings. He became interested in standardization first in the operations of his own company. As his company became more thoroughly standards-conscious, Mr Coonley became aware that there was a limit beyond which their standards activities were unable to go. The block came at the point where Walworth products were put into use with those of other manufacturers. To iron out that bottleneck, Mr Coonley began to meet with other manufacturers of valves and fittings who were interested in cutting costs, improving efficiency, and conserving materials. It was not too long before this informal get-together of individuals grew into a formal organization. The Manufacturers Standardization Society of the Valve and Fittings Industry was the result.

Over a period of 40 years, Howard Coonley has maintained his interest in the organization that he helped to start. For the entire 40 years he has shown that interest by serving as the Society's General Chairman.

Above, J. Howard Williams, Grinnell Corporation, oldest member of MSS both in length of service and in age, is shown presenting the Society's scroll to Mr Coonley. The scroll honors Mr Coonley:—

"For devoted service of 40 years as General Chairman of the Society since its founding

"For his vision, wisdom, and guidance in the Society's affairs

"For a lifetime of loyalty which enabled a small group to accomplish large deeds under his leadership

"His experience as an industrial statesman of National and International reputation has been of great assistance in establishing the MSS and gaining recognition of its work throughout the country

"He more than most, by his warmth and kindness, has inspired all those who have had the privilege of being associated with him."

1953 Revision for Plain Washers

by W. L. Barth

A revised edition of the American Standard for Plain Washers, now identified as B27.2-1953, has been approved. In the main it is an editorial revision of the 1949 edition, with clarification and rearrangement of the dimensional tabulations. The revision was developed by ASA Sectional Committee B27 which is jointly sponsored by the American Society of Mechanical Engineers and the Society of Automotive Engineers.

As rearranged in the revised standard, the washer dimensions are published in a composite tabulation in ascending order of the inside diameters, the outside diameters, and the thicknesses. The nominal sizes and the series designations of light, medium, heavy and extra heavy, specified in the previous edition, have been omitted. The thickness tolerance has been clarified by supplementing the nominal decimal thicknesses with the minimum and maximum decimal thicknesses representing the extreme limits.

Experience of users and producers indicates that the American Standard for Plain Washers has, to a considerable extent, achieved its purpose of concentrating usage on a limited selection which is nevertheless adequate for most general purpose applications.

W. L. Barth, General Motors Corporation, is Chairman, Sectional Committee B27, on Standardization of Washers and Machine Rings.

Machine Tapers Revised

Three basic changes have been made in the American Standard for Machine Tapers, B5.10-1953. The new edition, just approved, is a revision of the 1943 standard. It includes $\frac{1}{2}$-in. and $\frac{3}{4}$-in. taper per foot, as well as a list of the general dimensions of the $3\frac{1}{2}$-in. taper per foot series.

The three changes in the edition are as follows:

First: All threaded holes now call for

the Unified Thread Standards.

Second: The No. 6 taper has now been included as part of the standard, and is not treated as a special. This was brought about because of its use among drill manufacturers.

Third: Changes have been made in the headings of the various columns. These changes were made to bring them in line with the nomenclature in use by the American Cutting Tool Institute and the trade at large.

With the American Standard in effect, it was found that the variety of machine tapers in use could be gradually reduced, bringing about uniformity, and making it possible for machine manufacturers and tool builders to realize tremendous savings.

The new edition was prepared by ASA Sectional Committee B5 on Small Tools and Machine Tool Elements, sponsored under the procedure of the American Standards Association by the American Society of Mechanical Engineers; the Metal Cutting Tool Institute; the National Machine Tool Builders' Association; and the Society of Automotive Engineers.

It is being published by the American Society of Mechanical Engineers. Copies can be ordered from ASME or from the American Standards Association.

New Standards of Heat Capacity

With the extension of heat measurements toward the extremes of the temperature scale, the National Bureau of Standards is developing new standards of heat capacity for use at temperatures where water, the present standard substance, cannot conveniently be employed. Special samples of three materials—benzoic acid, *n*-heptane, and aluminum oxide—have already been prepared and their heat capacities determined over most of the useful temperature range. A limited number of these samples are being made available to laboratories equipped to make very precise measurements of heat capacity.

Because water is universally available in high purity, it has been used as a standard for heat-capacity measurements since the early development of calorimetry. However, recent developments in such fields as low-temperature physics, nuclear engineering, and jet propulsion have made it necessary to extend heat measurements to both very high and very low temperatures. Although water has served admirably as a heat-capacity standard in the range from 0 to 100C, it is not well suited to use outside this range. Below 0C its large expansion on freezing makes it too hazardous for many calorimeters while above 100C its increasing vapor pressure usually makes it impractical for use.

In the past there has been considerable discrepancy between calorimetric results obtained by various investigators using different types of apparatus, particularly at high temperatures. It is hoped that the heat-capacity standards under development at NBS will provide a means of comparing measurements made in different laboratories under different experimental conditions. Such standards should also make it possible for workers in calorimetry to check the absolute accuracy of their results over a much broader temperature range than heretofore and to accurately calibrate their apparatus in the absence of other, more elaborate means of calibration.

Announcing New Books . . . .

• **Simplified Drafting Practice.** By William L. Healy and Arthur H. Rau. (John Wiley and Sons, 440 Fourth Avenue, New York 16, N. Y. $5.00)

Specific suggestions for elimination of non-essential details and for use of simplified practices and routines in preparing drawings are presented in detail. The simplified methods make it possible to cut down time and materials and result in substantial savings, the authors point out. The methods outlined are based on a comprehensive study of drafting practices throughout the General Electric Company that resulted in development of simplified practices in that company.

The authors are both members of ASA Sectional Committee Y14 on Standards for Drawing and Drafting Practices.

Mr Healy, recently elected president of the Standards Engineers Society, is a member of Y14's editing committee. Mr Rau is chairman of subcommittee 1 of the Y14 committee. He is also a member of the executive committee of Technical Drawing Associates.

Both Mr Healy and Mr Rau are with the General Electric Company. Mr. Healy is Supervisor of Technical Service, Switchgear Department, Philadelphia. Mr Rau is Manager, Drafting Services Section, Engineering Services Division, and is responsible for the coordination of drafting practices and procedures for the entire company.

• **ASME Screw Thread Manual. A Shop and Drafting Room Abridgment of the American Unified Standards for Screw Threads and Their Gages.** Edited by Henry R. Cobleigh. 1953. $2.50 (Published by American Society of Mechanical Engineers. Order from American Standards Association, 70 East 45th Street, New York 17, N. Y.)

This manual is designed especially for shop and drafting room use. It gives the substance of everything in the American Unified Standards for Screw Threads and Their Gages needed to select, design, or make and test those threads most widely used. These widely used threads are Coarse, Fine, and 8-Thread Series of standard threads of Classes 2A and 2B, from the smallest to $1\frac{1}{2}$ inches diameter. Tables give the limiting dimension for these threads.

The manual also makes it possible to calculate by simple arithmetic all other standard threads and gages in these American Standards, as well as all special threads of the new A and B classes except those of abnormal diameter, pitch, or length of engagement.

Supplementary information contained in the Introduction and Appendices includes a history of screw thread unification, and handy tables. One of these shows what thread pitches are available for each diameter in the six series of standard threads. Draftsmen and designers find such a table important in selection of screws to be used in new designs. Another table gives compact formulas for all major, pitch, and minor diameters for the six unified classes, a time saver for those who otherwise would have to locate them in the text. Still another table converts inch limits to millimeters for the most widely used threads. This will be useful in interpreting specifications received from or sent to countries that use the Metric System.

• **Selection and Use of Engine Antifreezes.** (American Society for Testing Materials, 1916 Race Street, Philadelphia 3, Pa. 16-page report, $.40; reduced prices on quantity orders.)

The purpose of this new publication of the American Society for Testing Materials is to provide consumers with practical information and advice on engine cooling system antifreezes and corrosion inhibitors. Other cooling system service products, such as cleaning compounds and stop-leaks, are also discussed. The references to cooling system services are confined to the practices directly affecting antifreeze, since the subject of general cooling system maintenance is already covered in published automotive literature.

Prepared by a special group of the members of Committee D-15 on Engine Antifreezes, it has a general introductory statement followed by sections dealing with classification of types, installation and servicing, testing, mixing of different types, re-use of solutions, and stop-leak products.

Standards From Other Countries

Members of the American Standards Association may borrow from the ASA Library copies of any of the following standards recently received from other countries. Orders may also be sent to the country of origin through the ASA office. The titles of the standards are given here in English, but the documents themselves are in the language of the country from which they were received. For the convenience of our readers, the standards are listed under their general UDC classifications.

003.62 Signs, Notations, Symbols

Chile ***INDITECNOR***

Symbols for most frequently used magnitudes 2.2-8

Netherlands ***(Temporary) V***

Mathematical symbols for use in printing V 972

332.1 Banking

France ***NF***

Subscription register form for increase of capital K 12-63

5 different standardized forms for banking transactions K 11-08, K 11-62/65

389 Metrology. Weights and Measures

Hungary ***MNOSZ***

Inch-millimeter conversion table 158

Preferred numbers 138, 1700

Poland ***PN***

Rules for preparation of specifications and standards N-02001

526 Geodesy and Cartography

Poland ***PN***

Surveying instruments: spike and loop N-99312

Surveyors' levels. Classification M-54554

535 Optics

France ***NF***

Indexes of refraction and wave lengths relative to industrial measurements S 10-001

Optical lenses and their component parts S 10-002

Acceptance specifications for optical lenses S 10-003

Microscopes. Dimensions S 12-001

Microscopes. Marking of objectives and eye-pieces S 12-002

546 Inorganic Chemistry

India ***I.S.***

Sodium hydroxide 376

Potassium permanganate, technical and pharmaceutical 333

Potash alum, pharmaceutical 378

Anhydrous sodium sulfate, pharmaceutical 379

617.7 Ophthalmology

Spain ***UNE***

Special forms for oculists' records and prescriptions 43006

621.13 Railway Steam Locomotives

Germany ***D.I.N.***

Different types of rivets for locomotives (5 stds) 123,bb.1.302, 30506, bb.1-3

Round-head and countersunk rivets for locomotives 30509

Washout doors of locomotive boilers 38245

Poland ***PN***

4 standards for locomotive boilers, washout doors K-74111/2/3/4

2 standards for locomotive heating, piping K-75009, 75011

6 standards for locomotive blocks, brake parts K-91245/6;-48/51

621.64 Devices for Conveyance and Storage of Gases and Liquids in General

France ***NF***

5 standards for different gas cocks E 29-121 thru 125

Housing for double-joint gas stopcocks E 29-127/8

Specifications for valves and traps for acetylene producing apparatus A 84-330

Flanged connections for flexible hoses used in petroleum industry. Nominal diameters 100-250 M 87-165

Germany ***D.I.N.***

Flanged wedge disk valves, cast steel 3228

New Zealand ***NZSS***

Standard specification for lead pipes for other than chemical purposes 1053, Aug 1952

Spain ***UNE***

Ceramic pipes: dimensions and tolerances 41010

Table of standard pressures 19002

Different fittings for ceramic pipes 41011/15

Clay pipes 41009

United Kingdom ***BS***

Malleable cast iron and cast copper alloy pipe fittings for steam, air, water, gas and oil—screwed B.S.P. taper thread or API line pipe thread 143:1952

Malleable cast iron (white-heart process) and cast copper alloy pipefittings for steam, air, water, gas and oil—screwed B.S.P. taper male thread and parallel female thread 1256:1952

Flexible metallic tubing and connector ends for appliances burning town gas 669:1952

Hose couplings (air and water) (1/8 in. to 1 1/4 in. nominal sizes) 1906:1952

Union of Soviet Socialist Republics ***GOST***

35 standards, bound in one volume, for different malleable iron pipe fittings with tapered thread 6148 thru 6182-52

621.791 Welding

Netherlands ***(Temporary) V***

Welding terminology: Netherlands-English V 3016

South Africa ***SABS***

Standard specification for copper welding rods 391-1952

United Kingdom ***BS***

Filler rods for gas welding 1453:1952

621.85 Flexible Transmission

Denmark ***DS***

7 standards for Vee-belts and pulleys for Vee-belts F 399.1 thru F 399.7

Spain ***UNE***

Rigid couplings 18019/20

621.86/.87/.88 Hoisting and Conveying Machinery. Means of Attachment. Fastenings

Austria ***ÖNORM***

Wire rope thimbles M 9510

Wire rope clamps M 9511

France ***NF***

5 standards for different types of rivets E 27-151/155

Germany ***D.I.N.***

Methods of fastening buckets to conveyor belt 15236, B1, 4, 5

Method of wire testing in hoisting cable 51213

Stop-cables for hoists 15060

Different methods for attaching conveyor buckets 15236, B1.3

Endless traveling tables 15285

Bucket elevator 15251

Hexagon nuts, unfinished, M5 to M100 555, B1.1

Netherlands ***N***

Casing for screw bolts with triangular head. Dimensions N 1199

Castle nuts, unfinished, metric thread N 1231

Cardboard loading boards. Instructions for manufacturing (Temporary) V 3006

Poland ***PN***

Hexagon and square nuts, low type M-82293/4

5 standards for lock washers, machine screws, cap nuts M-82031, 82050, 82181/2, 82281

United Kingdom ***BS***

Keys and keyways 46:Part 1:1953

Undercuts and runouts for screw threads 1936:1952

621.89 Lubrication

India ***I.S.***

Method of sampling and testing of lubricants, Part I 310

Poland ***PN***

6 standards for lubricating nipples M-86001, 86011, 86013, 86042/3/4

South Africa ***SABS***

Standard specification for calcium-base lubricating grease 344-1952

Standard specification for sodium-base lubricating grease 351-1952

Standard specification for chassis grease 352-1952

Standard specification for refined internal combustion engine crankcase oil 9-1951

United Kingdom **BS**

Engine lubricating oils (H.D. type) 1905:1952

621.9 Tools, Machine Tools

Germany **D.I.N.**

Round punches from 0.75 to to 10.0 mm 9861

Side cutting nippers 9862

Hungary **MNOSZ**

5 standards for acceptance specifications of machine tools and tools 772/4, 1186, 1190

Series of 45 standards for different type of cutting tools 1245/7, 1250/1, 1258, 1260/8, 1270-1299

Series of 60 standards for different type of cutting tools —plain, high speed, sintered, etc 1901-1911, 1914-1962

Crushing machine, acceptance specification 1443

Netherlands **(Temporary) V**

Tools, lathe cutting tools 976

6 standards for different high speed and carbide alloy lathe cutting tools 1788-1793

Poland **PN**

Tinsmith's shears B-60025

Hand saws D-54051/2

4 standards for woodworking machines: Planers and knives D-54700, 54710, 56201, 54203

17 standards for lathe tool and work holders, jigs, etc M-53140, 58508/11, 60159, 61209, 61268/9, 61278/9, 61311, 61313, 61315, 61317/8, 63600

Scribers M-63701

Pipe spreaders M-64338/9

Shoemaker's tools O-54021/3, 54026

United Kingdom **BS**

Jig bushes 1098:1953

Hacksaw blades 1919:1953

Adjustable adaptors for multiple spindle drilling heads 1935:1953

Engineers' ratchet braces and drilling pillars 1937:1953

624/.1 Civil Engineering. Earthwork, Foundations

Austria **ÖNORM**

Free-standing chimney and similar structures B 4006

France **NF**

Cast iron door- and window-sills P 27-401

Germany **D.I.N.**

Ventilation ducts in dwellings 18017

Rules for the installation of gas appliances in dwellings 18018

Scaffolding ladders, one piece 4411

Concrete compressing machine 4235

Ireland **Irish Standards**

Flush wood doors 48:1953

Poland **PN**

Reinforced concrete construction. Designing. Calculation of static load B-0326

3 standards for wooden door frames B-91061/2/3

Spain **UNE**

Determination of porosity of soil 7045

625.17 Care of Railroad Track

South Africa **SABS**

Standard specification for spades and shovels 284-1951

Standard specification for picks, beater picks and mattocks 341-1951

628 Sanitary Technology

New Zealand **NZSS**

Standard specification for dimensions and workmanship of fireclay sinks 658, Aug 1952

Standard specification for fireclay urinals, stall type 682, Sept 1951

Standard specification for household septic tanks 758, Aug 1951

Poland **PN**

6 standards for cast iron soil pipes and fixtures H-74006/7; -74009/10; -74081; -74085

628.1/.2 Water Supply for Towns and Villages. Sewers

Czechoslovakia **CSN**

Cast iron sewage pipes and fittings 1440

Germany **D.I.N.**

General consideration regarding laying sewer pipe lines 1213

3 standards for different sewer pipe fittings 545, 1177, 1178

Rules for construction of catch basin in gasoline refineries 1999, B1.1, 2

Sewer discharge pot of concrete 4052

Water pressure tank, welded 4810

Israel **SI**

Calculation of water cost 44

Netherlands **N**

Drainage concrete accessories for streets N 131

629.12 Ships and Shipbuilding

France **NF**

15 standards for different types of interior and exterior scuppers, strainers, etc J 42-100, -102, -105, -110, -114, -118, -140, -150, -153/4/5/6, -160, -162, -164

Round-threaded marine bolts J 12-210

Germany **D.I.N.**

11 standards for marine pipe fittings 86050-86054, 86058, 86062, 86073, 86074

Japan **JIS**

Anchors F 3301

Anchor chain, electrically welded F 3303

Marine floodlight projector F 8417

Netherlands **N**

Bow shackles 965

Poland **PN**

19 standards for anchor chains, chain links, hooks, etc W-82205; -83514; -517; -521; -89057; -250/7; -306/9

4 standards for parts of ships' derricks W-89305, 89312/3/4

10 standards for hand pumps and parts W-44801/10

632 Protection of Plants. Diseases and Pests

France **NF**

Barium fluosilicate U 43-013

Sodium fluosilicate U 43-014

Formaldehyde, agricultural U 43-016

Nicotine and nicotine sulfate, chemical analysis of U 43-106

Iron sulfates, chemical analysis of U 43-110

4 standards for antiparasitic chemicals and their analysis U 43-015, -113-115, -116

Hungary **MNOSZ**

Research in plant protective measures 59

662.6/.9 Fuel Industry

Mexico **DGN**

Coal fuel R-22

Netherlands **N**

Solid mineral fuels, determination of moisture 924

Poland **PN**

Classification of coke C-02051

3 standards for different cokes C-97953/4/5

Classification of coal G-97001

666 Glass and Ceramic Industry

Chile **INDITECNOR**

5 standards for round- and flat-bottom medicinal ampoules 2.26-1/-5

Plain transparent glasses: dimensions and packing 2.26.10

Czechoslovakia **CSN**

Sheet glass for windows 2211

France **NF**

Form of the mouth of glass goblet and of bottle necks for metal cap closure B 31-016

Ireland **Irish Standards**

Portland cement 1:1953

Japan **JIS**

Laboratory glassware *for export* R 3901

China toys, pottery and ornamental articles *for export* Z 5001

Mexico **DGN**

Glass sheets, common P-3

Poland **PN**

Clay bricks B-12033

4 standards for earthen jars for acids C-60003; -60005/6/7

9 standards for household glass ware A-13003/7; -13071/3; -13100

11 standards for laboratory glass ware C-13001; -007/8; -010; -012; -014; -019; -022/3; -026/7

5 standards for beer and soft drink bottles G-79005; -009; -011/2; -015

Reinforced concrete B-01250

Cement bricks B-14000

Portland cement 350 B-30001

Acid resistant stone jugs C-60004

Spain **UNE**

Safety glass 43010/1

Asbesto-cement tiles, plain and undulated 41007

667.6/.8 Paints, Varnishes, Lacquer, etc.

Austria **ÖNORM**

Rust preventive paint C 2351

Belgium **NBN**

Zinc oxide 248

Hungary **MNOSZ**

Sampling of pigments 810

Minium 811

Zink white	813
Lithopone	814

Mexico ***DGN***

Yellow and orange chromium pigment	K-43

Netherlands ***(Temporary) V***

Pigments. Test methods. Zinc chrome green	1941
Pigments. Test methods. Antimony white	1942

Poland ***PN***

6 standards for ship paints	W-81001-81006
6 standards for enamels, lacquers, etc for machines and apparatus	W-81007/10; 87012/3
3 standards for putty, fillers, etc	W-81017/8; 81022

South Africa ***SABS***

Standard specification for zinc chrome pigment	294-1952
Standard specification for red lead pigment for paints	395-1952
Standard specification for zinc chrome primer for non-reflective olive green camouflage enamel	396-1952

Spain ***UNE***

Different methods of paint and varnish tests	48014
Castor oil as base for varnishes and paints	48017
Petroleum ether solvent	48019
Ethyl acetate solvent	48020
Methyl acetate solvent	48021

United Kingdom ***BS***

Leafing aluminum flake (powder and paste) for paints	388:1952

677/.05 Textile Industry. Textile Machinery

Germany ***D.I.N.***

Different fabric patterns	61101
Wire ropes for cranes and hoists	655
Spinning machine gears	64114
6 standards for different parts of textile finishing machines	64907, 64912, 64920, 64925, 64940, 64623

India ***I.S.***

Method for estimation of small quantities of sulfuric and hydrochloric acids in cotton materials	389
Method for spray test for estimating the water repellency of water-resistant fabrics	390
Method for measuring resistances to penetration by water-resistant fabrics	391
Method for measuring the water absorption and penetration in water-resistant fabrics by a Bundersmann type apparatus	392

Ireland ***Irish Standards***

Irish handwoven tweed	30:1952

Japan ***JIS***

Grading of cotton yarn *for export*	L 1101

Mexico ***DGN***

Canvas mail bags for surface transportation	A-22
Canvas mail bags for air mail	A-23

New Zealand ***NZSS***

Standard specification for flock	757, July, 1950

Poland ***PN***

81 standards for different component parts for textile machinery, included in series	P-62000, 63000, 64000, 65000, 66000, 67000

South Africa ***SABS***

Standard specification for cotton bed sheets	336-1951
Standard specification for woollen flannel	415-1952

United Kingdom ***BS***

Width of woven or knitted fabrics when relaxed at zero tension	1930:1953
Length of woven or knitted fabrics	1931:1953
Breaking load and extension of yarn	1932:1953

744 Technical Drawings

France ***NF***

Graphical symbols for faucets, valves, etc	E 04-051
Graphical symbols for ball and roller bearings	E 04-114
Conventional representation of commonly used springs	E 04-115

Germany ***D.I.N.***

Surface finish designation of ceramic products	140, B1.7

Hungary ***MNOSZ***

Lines and scales	976/7

Poland ***PN***

Nomenclature and scales	B-01000

771 Photographic Materials

Germany ***D.I.N.***

Form and dimension of threaded and non-threaded attachment ends of lens	19002,B1.1

Poland ***PN***

Photographic paper; sizes and packing	C-99000
Photographic plates; sizes and packing	C-99103

WHAT IS YOUR QUESTION?

Can you tell us where to find information on safe construction and use of wooden window jacks for painting, scaffolding, and general maintenance work?

Window jacks are covered in the American Standard Safety Code for Building Construction, A10.2-1944. Part 9 of this standard is concerned with scaffolds; section 17 covers window jacks.

What do the initials "AMS" mean?

As used in the standardization field, these initials refer to Aeronautical Material Specifications. These specifications can be obtained from the Society of Automotive Engineers, 29 West 39 Street, New York 18, N. Y.

Can you tell us whether there are standard dimensions covering flanges for pipes of 36 inches diameter and up, and pressures from 75 pounds per square inch to 500 pounds per square inch? We do not find such definitions in American Standards in our files.

In Table II of American Standard B16.1-1948, Cast Iron Pipe Flanges and Flanged Fittings, Class 125, there are data concerning flanges in nominal sizes up to 96 inches outside diameter. The pressure of 125 psi applies to temperatures up to 388 F. However, in "cold" condition, meaning under pressures existing under atmospheric conditions, that is up to 100 or 125 F, rating of 125 psi can be increased to 150.

The American Standard B16b-1944, Cast Iron Pipe Flanges and Flanged Fittings, Class 250, gives in Table II dimensions of flanges up to 48"OD. The pressure of 250 psi, for which this standard was established, can be raised to 300 psi, under "cold" conditions.

We have trouble in identifying products we buy in different types and sizes according to American Standards. Would it be possible for committees developing American Standards for mechanical components, for example (bolts, nuts, screws, washers), to include a method of designating each type and size by a specific symbol? Such a symbol could then be used on drawings, purchase orders, etc.

This has been done in a few instances. For example, the American Standard for Woodruff Keys, Keyslots and Cutters, B17f-1930, includes an identifying number for each key size. However, this is not a regular practice of standards committees at the present time.

AMERICAN STANDARDS

Status as of April 20, 1953

Legend

Standards Council — Approval of Standards Council is final approval as American Standard; usually requires 4 weeks.

Board of Review—Acts for Standards Council and gives final approval as American Standard; action usually requires 2 weeks.

Standards Boards—Approve standards to send to Standards Council or Board of Review for final action; approval by standards boards usually takes 4 weeks.

Arbitration

In Miscellaneous Standards Board—

Commercial Arbitration, Standards for,
Submitted by: American Arbitration Association

Building

In Board of Review—

Hollow Non-Load-Bearing Concrete Masonry Units, Specifications for, ASTM C129-52; ASA A80.1 (Revision of ASTM C129-39; ASA A80.1-1942)

Hollow Load-Bearing Concrete Masonry Units, Specifications for, ASTM C90-52; ASA A79.1 (Revision of ASTM C90-44; ASA A79.1-1944)
Sponsor: American Society for Testing Materials

Standards Submitted—

Building Code Requirements for Minimum Design Loads in Buildings and Other Structures, A58.1
Sponsor: National Bureau of Standards

Consumer

In Board of Review—

Ordinary Bar Soap, Specifications for, ASTM D497-52; ASA K60.2 (Revision of ASTM D497-39; ASA K60.2-1949)

Palm Oil Chip Soap (Type A, Straight—Type B, Blended), Specifications for, ASTM D536-52; ASA K60.16 (Revision of ASTM D536-42; ASA K60.16-1949)
Sponsor: American Society for Testing Materials

Electrical

American Standards Approved—

Code for Protection Against Lightning, Part I, Protection of Persons, NFPA 78; NBS H46; ASA C5.1-1953 (Revision of ASA C5.1-1937)

Code for Protection Against Lightning, Part II, Protection of Buildings and Miscellaneous Property, NFPA 78; NBS H46; ASA C5.2-1953 (Revision of ASA C5.2-1937)

Code for Protection Against Lightning, Part III, Protection of Structures Containing Flammable Liquids and Gases, NFPA 78; NBS H46; ASA C5.3 (Revision of ASA C5.3-1944)
Sponsors: National Bureau of Standards; National Fire Protection Association; American Institute of Electrical Engineers

In Board of Review—

Direct-Acting Electrical Recording Instruments, Switchboard and Portable, C39.2
Sponsor: Electrical Standards Committee

Dimensional Characteristics of Electron Tubes (RMA ET-105-A; NEMA 502-A), ASA C60.2 (Supersedes C60.2-1949)
Sponsor: Joint Electron Tube Engineering Council

In Electrical Standards Board—

Copper Trolley Wire, Specifications for, (Revision of ASTM B47-49; ASA C7.6-1951)
Sponsor: American Society for Testing Materials

Reaffirmation Being Considered—

American Standard for Automatic Station Control, Supervisory and Telemetering Equipment, C37.2-1945
Sponsor: Electrical Standards Board

Fuels

In Miscellaneous Standards Board—

Definition of Terms, Gross Calorific Value and Net Calorific Value of Fuels, ASTM D407-44; ASA Z67.1
Sponsor: American Society for Testing Materials

Materials and Products

In Miscellaneous Standards Board—

Copper and Copper Base Alloy Forging Rod, Bar, and Shapes, ASTM B124-52; ASA H7.1 (Revision of ASTM B124-51; ASA H7.1-1953)

Free-Cutting Brass Rod and Bar for Use in Screw Machines, ASTM B16-52; ASA H8.1 (Revision of ASTM B16-51; ASA H8.1-1953)

Seamless Copper Pipe, Standard Sizes, ASTM B42-52; ASA H26.1 (Revision of ASTM B42-51; ASA H26.1-1953)

Seamless Red Brass Pipe, Standard Sizes, ASTM B43-52; ASA H27.1 (Revision of ASTM B43-51; ASA H27.1-1953)

Bronze Castings in the Rough for Locomotive Wearing Parts, ASTM B66-52; ASA H28.1 (Revision of ASTM B66-49; ASA H28.1-1953)

Car and Tender Journal Bearings, Lined, ASTM B67-52; ASA H291 (Revision of ASTM B67-49; ASA H29.1-1953)

Rolled Copper-Alloy Bearing and Expansion Plates and Sheets for Bridge and Other Structural Uses, ASTM B100-52; ASA H31.1 (Revision of ASTM B100-49; ASA H31.1-1953)

Brass Wire, ASTM B134-52; ASA H32.1 (Revision of ASTM B134-51; ASA H32.1-1953)

Leaded Red Brass (Hardware Bronze) Rod, Bar, and Shapes, ASTM B140-52; ASA H33.1 (Revision of ASTM B140-52; ASA H33.1-1953)
Sponsor: American Society for Testing Materials

Mechanical

American Standards Approved—

Spindle Noses and Arbors for Milling Machines, B5.18-1953

Involute Spline and Serration Gages and Gaging, B5.31-1953
Sponsors: American Society of Mechanical Engineers; Metal Cutting Tool Institute; National Machine Tool Builders Association; Society of Automotive Engineers

Safety Code for Mechanical Power-Transmission Apparatus, B15.1-1953 (Revision of B15-1927)
Sponsors: Association of Casualty and Surety Companies; International Association of Governmental Labor Officials; American Society of Mechanical Engineers

Compressed Gas Cylinder Valve Outlet and Inlet Connections, ASA B57.1-1953 (Revision of B57.1-1950)
Sponsor: Compressed Gas Association

In Board of Review—

Supplement No. 1 to American Standard Code for Pressure Piping, B31.1-1951, B31.1a
Sponsor: American Society of Mechanical Engineers

In Mechanical Standards Board—

Small Solid Rivets, ASA B18.1 (Revision of American Standards Small Rivets, B18a-1927; and Tinners', Coopers' and Belt Rivets, B18g-1929)
Sponsors: Society of Automotive Engineers; The American Society of Mechanical Engineers

Motion Pictures

American Standards Approved—

Screen Brightness for 35-Mm Motion Pictures, PH22.39-1953 (Revision of Z22.39-1944)

Method of Determining Resolving Power of 16-Mm Motion Picture Projector Lenses, PH22.53-1953 (Revision of Z22.53-1946)

Dimensions for 200-Mil Magnetic Sound Tracks on 35-Mm and 17½-Mm Motion Picture Film, PH22.86-1953

Dimensions for 100-Mil Magnetic Coating on Single-Perforated 16-Mm Motion Picture Film, PH22.87-1953
Sponsor: Society of Motion Picture and Television Engineers

Photography

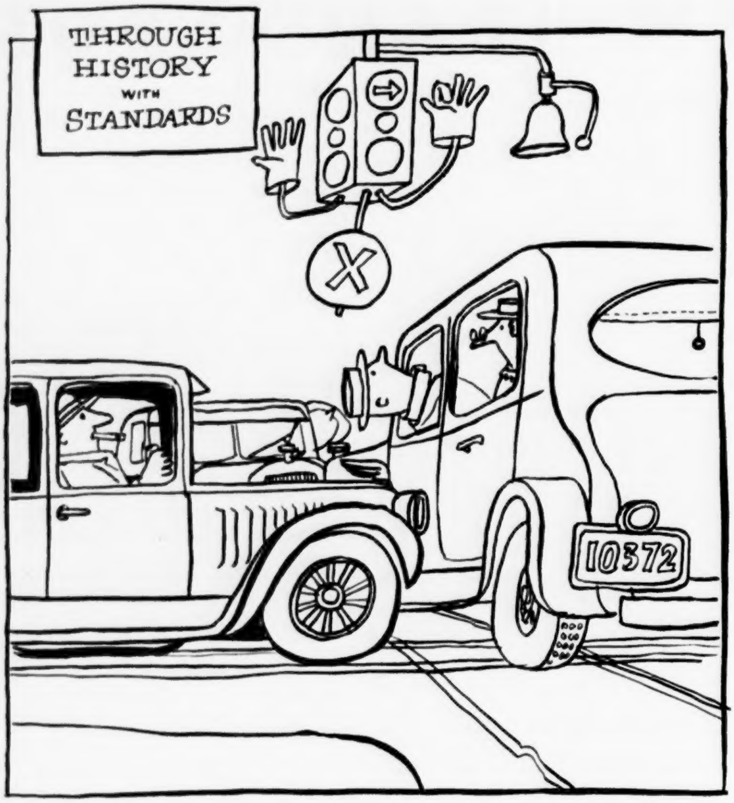
In Miscellaneous Standards Board—

Dimensions for Photographic Paper Rolls, PH1.11 (Revision of Z38.1.5-1943 and partial revision of Z38.1.6-1943)

Dimensions for Photographic Paper Sheets, PH1.12 (Partial revision of Z38.1.6-1943 and revision of Z38.1.43-1947)

Contact Printers, Specifications for, PH3.8 (Revision of Z38.7.10-1944)

Masks (Separate) for Use in Photographic Contact Printing of Roll Film Negatives,



One of a Series

Unstandardized Traffic Signals Were Driving Hazards in Early Days

As late as 1927 a color-blind autoist stood as good a chance as anyone of interpreting traffic signals. For lack of national standardization, he could choose between purple, orange, blue, green, yellow, and red lights for his directions as he drove from state to state. Green, for instance, was "Stop" in some states and "Go" in others. Red, instead of yellow, was the caution signal in New York City.

And a motorist would have to stop his modern low-vision car a block back from the next traffic light in order to see it. Early signal towers often were as high as the second story on business buildings.

These problems have been solved in two national codes—one on colors for traffic signals, and the other on street signs, signals, and markings.

A national code for colors for traffic signals was first formed in 1927 through work of the American Association of State Highway Officials, the National Bureau of Standards, and the National Safety Council. It was approved as an American Standard. It recommended green for "Go" and red for "Stop," now virtually a world standard.

The national code for street traffic signs, signals, and markings was first started in 1927 as an American Standard under the American Engineering Council. In 1935 a joint committee of the American Association of State Highway Officials and the National Conference on Street and Highway Safety drew up a Manual on Uniform Traffic Control Devices based on the prior work of the ASA project. It was approved as an American Standard. A new edition of the manual was begun in 1944 and published in 1948, containing significant revisions to meet present-day traffic conditions. Its recommendations for height of signals, and design and color of signs are almost universally followed in this country.

Specifications for, PH3.9 (Revision of Z38.7.12-1944)

Stereo Still Pictures on 35-Millimeter Film (5-Perforation Format), PH3.11

Attachment Threads for Lens Accessories, Specifications for, PH3.12 (Revision of Z38.4.12-1944)

Photographic Grade Blotters, PH4.10

Photographic Grade Ammonium Chloride (NH_4Cl), Specifications for, PH4.183

Photographic Grade Ammonium Sulfate ($(NH_4)_2SO_4$), Specifications for, PH4.184

Sponsor: Photographic Standards Board

Safety

American Standards Published—

Code for the Prevention of Dust Explosions in Flour and Feed Mills, Z12.3-1953; NFPA No. 61C (Revision of ASA Z12.3-1946) $0.35

Code for the Prevention of Dust Explosions in Terminal Grain Elevators, Z12.4-1953; NFPA No. 61B (Revision of ASA Z12.4-1950) $0.35

Code for the Prevention of Dust Explosions in Woodworking Plants, ASA Z12.5-1953; NFPA No. 663 (Revision of ASA Z12.5-1942) $0.25

Code for Pulverizing Systems for Sugar and Cocoa, ASA Z12.6-1953; NFPA No. 62 (Revision of ASA Z12.6-1946) $0.25

Code for the Prevention of Dust Explosions in Coal Pneumatic Cleaning Plants, ASA Z12.7-1953; NFPA No. 653 (Revision of ASA Z12.7-1946) $0.25

Code for the Prevention of Dust Ignitions in Spice Grinding Plants, ASA Z12.9-1953; NFPA No. 656 (Revision of ASA Z12.9-1946) $0.25

Code for the Prevention of Dust Explosions in the Manufacture of Aluminum Bronze Powder, ASA Z12.11-1953; NFPA No. 651 (Revision of ASA Z12.11-1946) $0.25

Code for the Prevention of Dust Ignitions in Country Grain Elevators, ASA Z12.13-1953; NFPA No. 64 (Revision of ASA Z12.13-1946) $0.25

Code for Explosion and Fire Protection in Plants Producing or Handling Magnesium Powder or Dust, ASA Z12.15-1953; NFPA No. 652 (Revision of ASA Z12.15-1946) $0.25

Code for the Prevention of Dust Explosions in Confectionery Manufacturing Plants, ASA Z12.18-1953; NFPA No. 657 $0.25

These standards are also available in one volume $3.00

Sponsor: National Fire Protection Association

Textiles

American Standards Published—

L22 Rayon and Acetate Fabrics	*Complete*	$4.25
Part 1, Women's and Girls' Rayon Wearing Apparel, and Test Methods		3.00
Part 2, Men's and Boys' Rayon Wearing Apparel, with Test Methods		2.80
Part 3, Rayon Home-Furnishings Fabrics, and Test Methods		2.65
Part 4, Test Methods (alone)		2.25

In Board of Review—

Definitions of Terms Relating to Textile Materials, ASTM D123-51; ASA L14.12 (Revision of ASTM D123-50; ASA L14.12-1951)

Sponsors: American Society for Testing Materials; American Association of Textile Chemists and Colorists

In Miscellaneous Standards Board—

Methods of Testing and Tolerances for Cotton Yarns (Revision of ASTM D180-52T; ASA L14.13-1951)

Methods of Test for Asbestos Yarns (Revision of ASTM D299-52T; ASA L14.18-1951)

Methods of Testing and Tolerances for Certain Wool and Part Wool Fabric (Revision of ASTM D462-52; ASA L14.28-1949)

Methods of Testing and Tolerances for Single Jute Yarn (Revision of ASTM D541-52; ASA L14.34-1951)

Methods of Testing Woven Asbestos Cloth (Revision of ASTM D577-52; ASA L14.35-1949)

Methods of Test for Clean Wool Content of Wool in the Grease (Revision of ASTM D584-52T; ASA L14.40-1951)

Methods of Testing Asbestos Tubular

(*Continued on page* 159)

HIGHLIGHTS OF PROJECT NEWS

These news briefs are condensed from reports presented by chairmen of the Standards Boards at a meeting of ASA's Standards Council April 2, 1953. The Boards are in charge of projects under ASA procedures in specific fields. Part I was published in the April issue.

PART 2

Electrical Standards Board—

Power Division—(P. H. Chase, chairman)

The greater majority of sectional committees under the jurisdiction of the Power Division indicate that work in their respective fields is progressing satisfactorily.

Although the C8 Sectional Committee on Insulated Wires and Cables has been rather inactive, Dr W. F. Davidson, chairman, has just asked members of his committee to review all of the existing C8 standards to determine whether or not they should be retained as American Standards and reaffirmed, or whether they should be revised. He has further asked them to review the entire field within their scope to determine whether the C8 Sectional Committee shall continue to exist in its present form, whether it should be discontinued, or whether its scope should be changed in any way. He proposes to call a meeting of the sectional committee within the next month or so to discuss these matters.

Lysle W. Morton, chairman of ASA Sectional Committee C34 on Mercury-arc Power Rectifiers, writes:

"A new form of power rectifier, variously called mechanical rectifier or contact rectifier has become available commercially since World War II. There is likelihood that C34 will, sooner or later, recommend that the mechanical rectifier should come within its cognizance for standardization. If this occurs, it is probable that a program of standardization of mechanical rectifiers will be on the agenda of C34 within the next five years.

"NEMA has nearly completed standards for rectifier units for various types of service. When these standards have been completed, it is possible that NEMA will ask the American Standards Association to review and approve them. If this happens, the work should come under the cognizance of C34. Action on this may be required within the next three years.

"AIEE standardization work is currently under way in connection with two products closely related to mercury-arc power rectifiers; namely, metallic rectifiers, and electron tube rectifiers. Close liaison exists between the AIEE Committee on Electronic Power Converters and the responsible AIEE committees working on the standardization of these two products. As this work develops, it may prove desirable for the American Standards Association to take coordinative action for the proper correlation of standardization work on these various types of equipment and products which are so closely related to each other and which may in certain instances tend to overlap. Because of its foundation of longer and wider experience in such matters, the responsibility for such coordinative work ought to come within the scope of C34. If so, this activity may come up within the next year or two."

V. L. Cox, Chairman of Sectional Committee C37 on Power Switchgear, has stated that the following AIEE standards can be made into American Standards:

AIEE-22 (July 1952) Air Switches, Insulator Units, and Bus Supports.

AIEE-25 (July 1952) Fuses above 600 Volts.

AIEE-27 (January 1952) Switchgear Assembles and Metal Enclosed Bus.

AIEE-50 (September 1949) Automatic Circuit Reclosers for A-C Distribution.

In reviewing the work of C59 Sectional Committee on Electrical Insulating Materials in General, A. H. Scott, chairman, states:

"During the past year, agitation has been growing both in the United States and internationally for thermally grading electrical insulating materials on a strictly materials basis. The AIEE has had a standard for temperature classification of insulating materials as components of rotating machinery for a number of years, but this has become inadequate with the advent of new materials in recent years. This standard is now under revision. Committee C59 feels that a more comprehensive study should be made of the effect of temperature on the electrical, physical, and chemical characteristics of insulating materials, so that these materials can be intelligently graded. Making this study and setting up a grade chart would require many years for accomplishment.

"Such a chart could then be used as a basis for relating the basic properties to the characteristics required when the materials are to be used as components of the various kinds of machinery. So Committee C59 proposes to push this study with the aid of whatever organizations it can enlist."

G. Q. Lumsden, chairman of Sectional Committee O5 on Wood Poles, says:

"There are no new areas for immediate consideration of standardization. For your information there has been relatively little activity in this committee since the adoption of Standard O5.1-1948, but based on discussions and correspondence during the past few weeks there are strong indications that the committee will have to take up its duties again in the near future. There are three points of interest, viz:

"1. *Review of the allowable fiber stresses of the standard pole species.* This is being brought to the fore because of projected ASTM tests to determine standard pole-breaking techniques. Funds are now being solicited by ASTM and it looks very much as if this project will become a reality within the year. If any data

are forthcoming from this study that indicate that ASA should revise its fiber stresses, the figures should be reviewed by our committee.

"2. *Consider new requirements for knots.* The Bell System is studying a new set of requirements for the maximum sizes of knots and of groups of knots for all pole species. These requirements are being set up on what is believed to be a much sounder engineering basis than in the past. The purpose is to limit size of individual knots or groups of knots based upon the known effect which these defects have on the section modulus of the poles. It is planned to try out the new requirements in production of poles for the Bell System. If successful, the new limits will be proposed for consideration by the sectional committee with the idea that they be included in Standard O5.1.

"3. *Study question of standardized framing and gaining.* A proposal has been made that standardized power and telephone framing and gaining of poles be considered. Frankly, the several engineers with whom I have talked are pessimistic that such standardization can be accomplished. The Committee should consider the matter, however."

Communications and Electronics Division—(Virgil M. Graham, chairman.)

Radio, C16—

This committee has been moderately active over the last few years. Several standards originating from the Radio-Television Manufacturers Association and the Institute of Radio Engineers have been processed as American Standards. A proposal to separate the work on electronic components into a new sectional committee sponsored by RTMA is now under consideration.

Dry Cells and Batteries, C18—

The sixth revision of the American Standard in this field may be completed in 1953.

Electron Tubes, C60—

This committee is active in keeping the American Standards in its field up-to-date with revisions in the standards of the formulating groups, RTMA-NEMA and IRE. These organizations are the only ones to date which have proposed material for consideration by C60. Revisions of existing standards are in process.

Radio-Electrical Coordination, C63—

This important committee has been quite active over several years. J. J. Smith, chairman, reports:

"This sectional committee was organized to provide a place where all groups interested in the problem of reducing interferences with radio communication caused by electrical equipment used for other purposes can work together to develop standards for measuring instruments and test methods, definitions of terms, and so forth. The scope is:

"Development of definitions and methods of measurement of noise and signal strengths, determination of levels of signal strength, levels of interfering sources, limiting ratio of noise to signal, and development of methods of control of influence, coupling, and susceptiveness."

Three subcommittees have been organized. Each consists of a chairman, who is a member of the sectional committee, and about ten or fifteen others who are not necessarily members of the sectional committee. These subcommittes are:

1. A technical committee to: (*a*) follow closely the programs of various coordinate committees and organizations; (*b*) cooperate in the development of needed techniques and instruments; (*c*) prepare proposed standards whenever the necessary basic material becomes available; and (*d*) suggest research or development projects necessary to insure a well rounded over-all program.

2. A technical committee on Definitions and Terminology.

3. An advisory committe on Relations with CISPR (International Special Committee on Radio Interference).

In 1946 the sectional committee adopted a measurement method to meet the needs of the Armed Forces. This was American Standard C63.1-1946 on Methods of Measuring Radio Interference of Electrical Components and Completed Assemblies of Electrical Equipment for the Armed Forces, 150 kilocycles to 20 megacycles.

As indicated in the title, the method applies only to equipment for the Armed Forces. This standard is also designated as Joint Army-Navy Specifications JAN-I-225. It does not include performance specifications for measuring instruments nor does it include limiting values for the quantities to be measured.

During the past few years, the sectional committee has developed standards for radio noise and field intensity meters for the frequency range of 15 kilocycles to 1000 megacycles. These are:

Proposed American Standard Specifications for a Radio Noise Meter, 0.015 to 25 Megacycles/Second, C63.2.

Proposed American Standard Specifications for Radio Noise and Field Intensity Meters, 20 to 1000 Megacycles/Second, C63.3.

Both of these proposed standards have been published for trial and study. Several instruments are being manufactured, each of which covers some portion of the above frequency range. Measurements can be made at any frequency within the over-all range with an instrument which has, at least approximately, the characteristics specified in the proposed standard.

The sectional committee is now developing measurement methods to revise those of C63.1 and to provide for measurements on commercial apparatus. The Armed Forces are in the process of revising Specification JAN-I-225. The Navy has already adopted a revision and extension designated as MIL-I-16910 (Ships) Interference Measurement, Radio Methods and Limits, 14 kilocycles to 1000 megacycles, 14 January 1952. The first issue was amended (Amendment 2) under date of 25 June 1952. Instrument specifications are included which are substantially the same as those of C63.2 and C63.3, listed above. Limits applicable to Navy equipment are given. It is proposed to further develop this Navy specification so that it will meet the needs of all of the Armed Forces, in which case a specification will be issued under another number. Meanwhile

Specification MIL-1-16910 has been printed and circulated for Navy use and for study by those interested. Committee C63 is considering the measurement methods of this Navy specification for inclusion in a proposed American Standard specification on methods.

Regarding limits, the sectional committee feels it is desirable to develop a definite standard for the radio noise measurement, and to obtain approval of the proposed standards for radio noise meters before recommending limits. Accordingly, the committee is placing emphasis on these aspects of the problem.

The CISPR, at its last meeting, July 1950, adopted a limit of 1500 microvolts for certain types of apparatus. Another meeting of CISPR is to be held in Europe during the summer of 1953. A definite evaluation of the limiting value of 1500 microvolts cannot be made until we know what the instrument characteristics are and what test circuits will be used. However, it is planned to hold a meeting of Committee C63 prior to the CISPR meeting to discuss this question.

Objectives for the immediate future are:

1. Adoption of the proposed standards for radio noise and field intensity meters C63.2 and C63.3.
2. Development of standards for the measurement of radio noise, which includes equipment for the Armed Forces and also commercial equipment.
3. Presentation of U.S. recommendations to CISPR in the field of measurements of radio noise both on instruments and methods of test.

Acoustical Measurement and Terminology, Z24—

This committee has underway 25 projects scheduled for one to three years for completion. Most of these projects are new; only a couple are revisions.

Graphic Standards Board—

(H. P. Westman, chairman)

Six sectional committees report to GSB: Abbreviations, Y1; Letter Symbols, Y10; Drawing and Drafting

(Continued on page 156)

This Month's Standards Personality...

Alexander Gobus, one of the country's leading experts on non-destructive testing, has just taken on a new responsibility. He has been appointed by North American Philips Company, Inc to manage a new department which will develop and market industrial radiographic and other non-destructive testing equipment. His headquarters will be in the X-ray Division of the company's Mt Vernon plant.

This is right in line with Mr Gobus' experience. He became well known throughout this country and in other countries when he extended his interest in fluoroscopy and radiography beyond the activities of his own company into the work of nationally recognized committees and societies. His work for seventeen years before he joined the Philips Company (from 1936 to 1953) was as vice-president, chief metallurgist, and director of non-destructive testing, for Sam Tour & Company, Inc.

During the war, ASA Committee Z54 found Mr Gobus' experience valuable in its pioneer work on safety standards for protection of individuals using radium radiation. This work was codified in an American War Standard. Mr Gobus now represents the American Welding Society on X-rays on the ASA sectional committee that is reviewing and revising that standard.

He is extremely active in the work of the American Society for Testing Materials. In this work he has often in the past recommended standards to ASA for approval. He hopes he will have occasion to do so often in the future.

Within a year subcommittee 2 of ASTM Committee E-7, of which Mr Gobus is chairman, will have completed standard reference radiographs for steel welds as ASTM E 99. He also has been instrumental in having standard radiographs for steel castings for high-pressure high-temperature adopted for use by public utilities. These standards were originally prepared and used by the Bureau of Ships, U.S. Navy. They are now available as ASTM E 72. As chairman of Subcommittee 2 Mr Gobus has had a hand in approval of standards for aluminum and magnesium castings for aircraft service, developed by the Bureau of Aeronautics, U.S. Navy.

Mr Gobus' activities in connection with welding have brought him invitations from a number of countries to consult with them on standards being developed. In this connection he works with the International Institute of Welding. He feels it is a distinct honor to be ASTM's representative on the Institute's Commission on Non-Destructive Testing which includes top men from each country in Europe.

During his career Mr Gobus has built up a reputation as author and lecturer. "Hot Radiography" is the title of one of his recent papers.

In his private life, Mr Gobus proudly boasts membership in the Marine Corps Fathers' Association. In the past he has been president of his tennis club and has won ribbons in photography exhibits. At present, however, his active hobby is fishing. As a member of the Huntington (Long Island) Anglers Club he is happy to add any piscatorial trophy to his record—from flounders and tuna to 300-lb swordfish.

(*Continued from page* 155)

Practice, Y14; Preferred Practice for the Preparation of Graphs, Charts, and Other Technical Illustrations, Y15; Graphical Symbols and Designations, Y32; Refrigeration Nomenclature, Y53.

Development of proposed American Standards in any one of these fields involves an unusual amount of coordination among many interested groups in widely divergent fields. This frequently leads to revision or abandonment of long standing accepted practices. Every effort is being made to unify the proposed standards with those in use by the Military. The work is being actively prosecuted but is necessarily slow. When the present program is completed, however, it will represent accomplishment of one of the most important and far-reaching activities of ASA.

Highway Traffic Standards Board

(Sidney J. Williams, chairman)

Several organizations in the highway traffic field have developed standards which have never been submitted to ASA for approval. There are apparently also other subjects worthy of standardization which have not yet been considered. A special subcommittee has been established to make a thorough study of the highway traffic standards program and report back to the Board with detailed recommendations.

Mechanical Standards Board—

(Frank T. Ward, chairman)

Among the 30-odd projects supervised by MeSB, several are handled by sectional committees of long standing and are dealing with standards of fundamental importance to the mechanical and other industries. Examples are the projects on Screw Threads; on Limits and Fits; on Small Tools and Machine Tool Elements; on Bolts, Nuts, Rivets, Screws, and Similar Fasteners; on Pipe Flanges and Fittings; and on the Code for Pressure Piping.

Most of these committees are continuously engaged either in the development of new American Standards or the revision of existing ones. This results in a regular flow of proposals to be considered by the MeSB.

Recent Submittals

As an illustration, from January 1 to March 27, 1953, ASA received nine cases for action by MeSB, including one proposed scope of a sectional committee; two proposed new American Standards; and six proposed revisions of American Standards.

The two new American Standards were those for Involute Spline and Serration Gages and Gaging, submitted by the sectional committee on Small Tools and Machine Tool Elements; and for Brass or Bronze Flanges and Fittings, 150 lb, submitted by the sectional committee on Pipe Flanges and Fittings.

Only two of the six proposed revisions need be mentioned here. One is a partial revision of the Code for Pressure Piping developed by ASA Sectional Committee B31. This American Standard has lately become even more important in connection with the construction of cross-country gas lines. Section 8 of the Code, dealing with Gas Pipe Line and Distribution Systems, was recently published as a separate document, mainly for this purpose.

The other proposed revision is the new American Standard, Compressed Gas Cylinder Valve Inlet and Outlet Connections. It was prepared and submitted by the Compressed Gas Association, as the Proprietary Sponsor, and contains new data which apply to cylinders carrying medical gases. These data are important also as a possible basis for international unification under consideration in ISO/TC 58, Gas Cylinders.

General Conferences

During the first quarter of the year, two general conferences were held by ASA to consider initiation of an ASA project. (Sawmills, STDZN, March, p 78; motion-time data, March, p 94.)

A third ASA general conference will be held on April 30[1] to consider a request from the American Society of Tool Engineers that an ASA project be initiated on Industrial Diamonds and Accessories for their use.

[1] This conference has been held since presentation of this report. Results will be reported in the June issue.

This matter is important in the manufacture of many parts made with high precision and with high-grade surface quality, as components of mechanical, electrical, and electronic equipment.

MeSB Sponsorships

The MeSB is sponsor for three projects under its supervision: Ball and Roller Bearings, B3; Indentification System for Anti-Friction Bearings, B54; and Colors for Industrial Apparatus and Equipment, Z55.

The project on Ball and Roller Bearings should be mentioned here both for its national work and its cooperation in the international work of ISO/TC 4. ASA has charge of the secretariat of the ISO Subcommittee on Tapered Roller Bearings which faces the difficult task of developing a proposal expected to be acceptable to inch, as well as metric, countries. In regard to ball bearings and cylindrical roller bearings, a considerable degree of international uniformity in dimensions has been established.

The sectional committee on Identification System for Anti-Friction Bearings also has a difficult task. The formulation of a draft proposal is still in the hands of a subcommittee.

The sectional committee on Colors for Industrial Apparatus and Equipment, which has set up an American Standard for gray finishes, has not found any present need for standardization of other colors.

International Cooperation

International projects in the mechanical field may be divided into those handled under ISO procedure and those handled as ABC projects. The latter aim at unification of standards in the United Kingdom, Canada, and the United States.

ASA is on record as an active participant in the following ISO mechanical projects:

- Screw threads
- Ball and roller bearings
- Test pressures for the acceptance of stationary boilers, and unification of boiler construction codes
- Aircraft
- Automobiles
- Measurement of fluid flow
- Gas cylinders

ASA has the secretariat, and the

ASME Boiler Code Committee has charge of the technical details of ISO/TC 11 on Boiler Codes, which will hold its first meeting in Paris, in May. A Draft Proposal has been circulated.

Active participation in ISO projects on Small Tools (ISO/TC 29); Splined Shafts and Hubs (ISO/TC 32); and Machine Tools (ISO/TC 39) is under consideration as a result of effective cooperation between American and foreign experts in this field at the ISO meetings in New York, June, 1952.

Also under consideration is ASA participation in:

Pulleys and Belts (including V-Belts) ISO/TC 41 (of interest to ASA committee B55 on V-Belts and V-Belt Drives);

Sheet and Wire Gages (Designation of Diameters and Thicknesses), ISO/TC 62 (of interest to ASA committee B32 on Wire Diameters and Metal Thicknesses);

Material for Pipe Lines and Other Installations in the Field of the Petroleum Industry, ISO/TC 67 (of interest to ASA committees B2, B16, and B36); and

Automatic Instrument Control Terminology (a new ISO project recently proposed by Germany, on which ASA is now canvassing interested groups in the U.S.)

ABC Unification

An ABC Conference on Limits and Fits was held in New York last February. It was attended by delegations from industry and the Armed Forces in each of the three countries. They reached agreement on a "Draft Proposal for an ABC System of Limits and Fits" to serve as the basis for a national standard in each country.[2] Indications are that the British and Canadians will publish their own standards based on this proposal at an early date. In the U.S., ASA committee B4, on Allowances and Tolerances for Cylindrical Fits and Limit Gages, is expected to determine if American industry wants to have tables of recommended fits developed in accordance with the ABC Proposal, as Part II of American Standard B4.1-1947, Limits and Fits for Engineering and Manufacturing (Part I), approved by ASA in 1947.

Present and Future Activities

In addition to reviewing recent developments of projects under its supervision, the MeSB in its meeting on March 20 considered the question how future standardization activities in the mechanical field will probably develop and what could be done to strengthen the work in this field.

Mining Standards Board—
(M. D. Cooper, chairman)

A study committee has been set up to prepare recommendations for the MiSB regarding possible standardization of practices concerning roof bolting. Bolts are used in both coal and metal mines to assist in holding the roof in mine openings in place.

Evaluation of coal washing practices is a matter of concern both in the United States and in other countries. Some American companies that manufacture coal washing equipment, as well as American engineers who have been connected with installation of coal washing equipment in other countries, need uniform methods for determining the effectiveness of coal washing plants. A suggestion for a new project to provide standard practices has been considered.

The MiSB is being supported by many elements of the minerals industries, both groups that hold membership on the MiSB and others also, but has been somewhat handicapped by lack of staff assistance to prosecute effectively some of the undertakings which are being studied or have been suggested as appropriate for standardization.

Miscellaneous Standards Board—
(G. H. Harnden, chairman)

Three additional organizations are appointing representatives on the Board: Gas Appliance Manufacturers Association; National Association of Purchasing Agents; The Telephone Group.

MSB has responsibility for making recommendations to the Board of Review, the Standards Council, and to the chairman of the Council on approval of standards, initiation of projects, approval of personnel of sectional committees, and approval of scopes of projects for all cases falling outside the field of work of other standards boards. It is, therefore, not

(*Continued on page* 158)

² See pp 137-142, this issue.

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(*Continued from page* 157)
in a position to exercise the planning function accorded other Standards Boards. It functions only on cases presented to it.

MSB has recommended approval of 5 new photographic standards, revision of 14 others, and replacement of 4 American War Standards.

Five new standards and 33 revisions of test methods and materials specifications have been recommended for approval, as well as two new standards on gas burning appliances.

The scope for the project on Standard Method of Test for Calorific Value of Gaseous Fuels by Water Flow Calorimeter, Z68, has been approved, and the American Society for Testing Materials appointed as proprietary sponsor:

"This method of test is intended for use when water-flow calorimeters are used to determine the total and net calorific values of fuel gases as purchased and sold. The method is restricted to gaseous fuels having total calorific values in the range from 300 to 3000 Btu per standard cubic foot."

Similar action has been taken on the Method of Test for Specific Gravity of Gaseous Fuels. The scope is: "These methods are for determining the specific gravity of gaseous fuels, including liquefied petroleum gases, in the gaseous state at normal temperatures and pressures."

Action has been withheld on recommendation on approval of Proposed Standard Definitions of the Terms Gross Calorific and Net Calorific Value of Fuels, pending clarification of the scope by the sponsor.

The Board has recommended that ASA headquarters request proprietary sponsors, in those cases where the ballot in a committee of the sponsor shows less than 60 percent voting, to submit further information on the adequacy of the vote and to indicate the distribution of interest within the developing committee or subcommittee. This recommendation has been referred to the Committee on Procedure.

Photographic Standards Board—
(Paul Arnold, chairman)

A total of 40 standards has been acted on, and a considerable number of new standards are in process of development in all five committees under the jurisdiction of this Board. Preliminary studies are also being made of possible new topics for standardization.

An Administrative Committee set up to assist ASA in carrying out its duties as Secretariat for ISO/TC 36, Cinematography and ISO/TC 42, Photography, has also been active.

Preliminary studies have been made by PSB regarding the possibility of setting up a new sectional committee on photographic documentation (STDZN, April, page 121).

A revised scope for Sectional Committee PH22 on Standards for Motion Pictures clarifies the concern of this committee with motion picture aspects of television. The new scope reads:

"The Sectional Committee on Motion Pictures, PH22, will define technical terms and prepare engineering standards for the field of motion pictures, and for those segments of television and theater television that use techniques adapted from the motion picture industry."

Safety Standards Board—
(Edward R. Granniss, chairman)

The accomplishments of the American Standard safety program have been outlined in a booklet, "American Safety Standards," published by ASA late last year. In addition to supervising this program, the Safety Standards Board has acted on an international recommendation for standardizing dimensions of stretchers, stretcher carriers, and hospital trolleys. The Board has recommended that Standards Council approve this ISO Recommendation No. 11.

• • **An audience of more than 1,000** attended a session on the "Art of Inspection" during the Greater New York Safety Conference and Exposition, March 24-27. Henry Lamb, Safety Engineer of the American Standards Association, was chairman.

William G. Marks, chief of the Safety Standards Division, Bureau of Labor Standards, U. S. Dept. of Labor, presented a general discussion

of the fundamentals of inspection for industrial safety.

John A. Shannon, Supervisor, Boiler Division, Engineering Department, Fidelity and Casualty Company, discussed how the boiler inspector's work ties in with a safety program.

The fire inspector's work and how it fits into the safety program was the subject of a paper by Allen L. Cobb, Director of Fire Protection and Safety, Kodak Park Works, Eastman Kodak Company. Mr Cobb is president of the National Fire Protection Association.

• • **From Free China, Formosa,** comes news that some 120 new and revised specifications, to cover their industrial requirements, are now listed in the recently published catalog of Chinese National Standards.

A CNS Mark certifying that products meet the requirements of these standards is being voluntarily adopted by producers and is coming into wide use, S. T. Shang, Director of the Chinese National Bureau of Standards, reports.

Translations of the report on "Dollar Savings Through Standards" (STDZN, October 1951) have been circulated to all factories and mines, Mr Shang declares.

• • **The Standards Association of Yugoslavia** announces appointment of Slavko Vitorovic as president. Mr Vitorovic is a graduate engineer. He succeeds Mile Ljubicic. The Yugoslavian Association is a member of the International Organization for Standardization.

• • **James L. Cranwell,** has been elected vice-president-New York by directors of the Pennsylvania Railroad. Mr Cranwell, who has been with the company since 1926, had served as assistant vice-president for more than a year. He is a member of the Board of Directors of the American Standards Association.

American Standards

(Continued from page 152)

Sleeving (Revision of ASTM D628-52; ASA L14.41-1949)

Methods of Testing and Tolerances for Jute Rope and Plied Yarn for Electrical and Packing Purposes (Revision of ASTM D681-52; ASA L14.44-1949)

Methods of Testing and Tolerances for Rope (Leaf and Bast Fibers) (Revision of ASTM D738-52; ASA L14.45-1949)

Methods of Testing and Tolerances for Spun, Twisted or Braided Products Made from Flax, Hemp, Ramie, or Mixtures Thereof (Revision of ASTM D739-52; ASA L14.46-1949)

Recommended Practice for Universal System of Yarn Numbering (Revision of ASTM D861-52; ASA L14.48-1951)

Methods of Test for Small Amounts of Copper and Manganese in Textiles (Revision of ASTM D377-52T; ASA L14.49-1949)

Methods of Testing Felt (Revision of ASTM D461-50; ASA L14.52-1951)

Sponsors: American Society for Testing Materials; American Association of Textile Chemists and Colorists

Recent Publications Received from ASA Members

American Institute of Architects

Seminar on The Modular Method for Lower Building Costs "A New Approach to Cost Reduction in the Building Industry." $1.75

Heat Exchange Institute

Standards for Steam Surface Condensers. (Third Edition, 1952) $2.00

American Water Works Association

Standard Specifications for Steel Pipe Flanges, AWWA C207-52T. $.25

American Society for Testing Materials

(Compilations of ASTM standards include many approved as American Standard)

ASTM Standards on Rubber Products (Compilation. Revised Dec 1952) $5.00

ASTM Manual of Engine Test Methods for Rating Fuels (Second edition. 1952) $8.00

ASTM Standards on Petroleum Products and Lubricants (Compilation. Revised Nov 1952) $5.75 heavy paper cover; $6.40 cloth bound

ASTM Specifications for Steel Piping Materials (Compilation. Revised Dec 1952) $3.75

Fifty-Year Index to Technical Papers and Reports, 1898-1950. (Published 1952) $6.00

American Society for Testing Materials and American Welding Society

Specifications for Copper and Copper-Alloy Welding Rods (ASTM B259T; AWSA 5.7-52T) $.40

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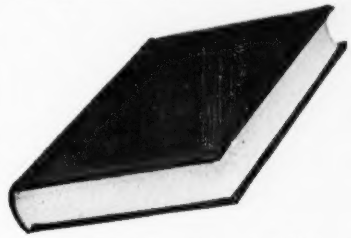

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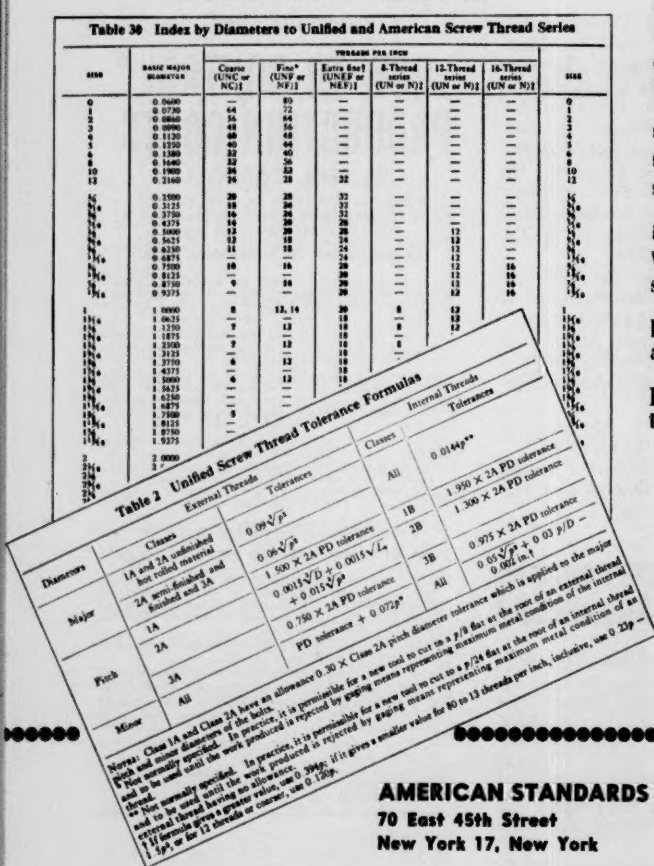

Table 30 Index by Diameters to Unified and American Screw Thread Series

Size	Basic major diameter	Coarse (UNC or NC)‡	Fine* (UNF or NF)‡	Extra fine† (UNEF or NEF)‡	8-Thread series (UN or N)‡	12-Thread series (UN or N)‡	16-Thread series (UN or N)‡	Size
0	0.0600	—	80	—	—	—	—	0
1	0.0730	64	72	—	—	—	—	1
2	0.0860	56	64	—	—	—	—	2
3	0.0990	48	56	—	—	—	—	3
4	0.1120	40	48	—	—	—	—	4
5	0.1250	40	44	—	—	—	—	5
6	0.1380	32	40	—	—	—	—	6
8	0.1640	32	36	—	—	—	—	8
10	0.1900	24	32	—	—	—	—	10
12	0.2160	24	28	32	—	—	—	12
1/4	0.2500	20	28	32	—	—	—	1/4
5/16	0.3125	18	24	32	—	—	—	5/16
3/8	0.3750	16	24	32	—	—	—	3/8
7/16	0.4375	14	20	28	—	—	—	7/16
1/2	0.5000	13	20	28	—	12	—	1/2
9/16	0.5625	12	18	24	—	12	—	9/16
5/8	0.6250	11	18	24	—	12	—	5/8
11/16	0.6875	—	—	24	—	12	—	11/16
3/4	0.7500	10	16	20	—	12	16	3/4
13/16	0.8125	—	—	20	—	12	16	13/16
7/8	0.8750	9	14	20	—	12	16	7/8
15/16	0.9375	—	—	20	—	12	16	15/16
1	1.0000	8	12, 14	20	8	12		1
1 1/16	1.0625	—	—	18	—	12		1 1/16
1 1/8	1.1250	7	12	18	8	12		1 1/8
1 3/16	1.1875	—	—	18	—			1 3/16
1 1/4	1.2500	7	12	18	8			1 1/4
1 5/16	1.3125	—	—	18	—			1 5/16
1 3/8	1.3750	6	12	18				1 3/8
1 7/16	1.4375	—	—	18				1 7/16
1 1/2	1.5000	6	12	18				1 1/2
1 9/16	1.5625	—	—					1 9/16
1 5/8	1.6250	—	—					1 5/8
1 11/16	1.6875	—	—					1 11/16
1 3/4	1.7500	5	—					1 3/4
1 13/16	1.8125	—	—					1 13/16
1 7/8	1.8750							1 7/8
1 15/16	1.9375							1 15/16
2	2.0000							2

Table 2 Unified Screw Thread Tolerance Formulas

Diameters	External Threads: Classes	External Threads: Tolerances	Internal Threads: Classes	Internal Threads: Tolerances
Major	1A and 2A unfinished hot rolled material	$0.09\sqrt[3]{p^2}$	All	$0.0144p$**
	2A semi-finished and finished and 3A	$0.06\sqrt[3]{p^2}$		
Pitch	1A	1.500 × 2A PD tolerance	1B	1.950 × 2A PD tolerance
	2A	$0.0015\sqrt[3]{D} + 0.0015\sqrt{L_e} + 0.015\sqrt[3]{p^2}$	2B	1.300 × 2A PD tolerance
	3A	0.750 × 2A PD tolerance	3B	0.975 × 2A PD tolerance
Minor	All	PD tolerance + $0.072p$*	All	$0.05\sqrt[3]{p^2} + 0.03\,p/D - 0.002$ in.†

NOTES: Class 1A and Class 2A have an allowance 0.30 × Class 2A pitch diameter tolerance which is applied to the major pitch and minor diameters of the bolts.
* Not normally specified. In practice, it is permissible for a new tool to cut to a $p/8$ flat at the root of an external thread and to be used until the work produced is rejected by gaging means representing maximum metal condition of the internal thread.
** Not normally specified. In practice, it is permissible for a new tool to cut to a $p/24$ flat at the root of an internal thread and to be used until the work produced is rejected by gaging means representing maximum metal condition of an external thread having no allowance.
† If formula gives a greater value, use $0.394p$; if it gives a smaller value for 80 to 13 threads per inch, inclusive, use $0.23p - 1.5p^2$, or for 12 threads or coarser, use $0.120p$.

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